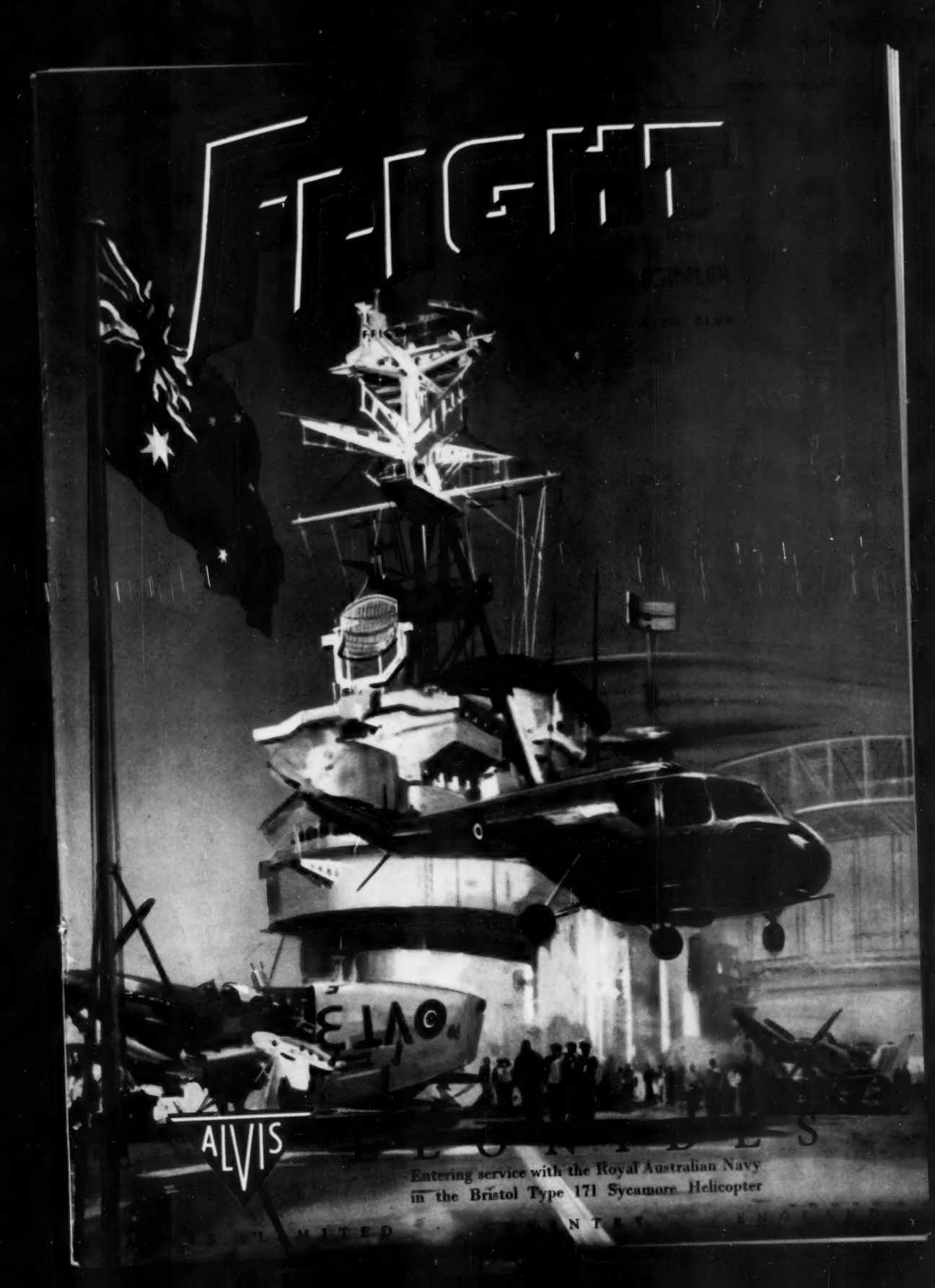

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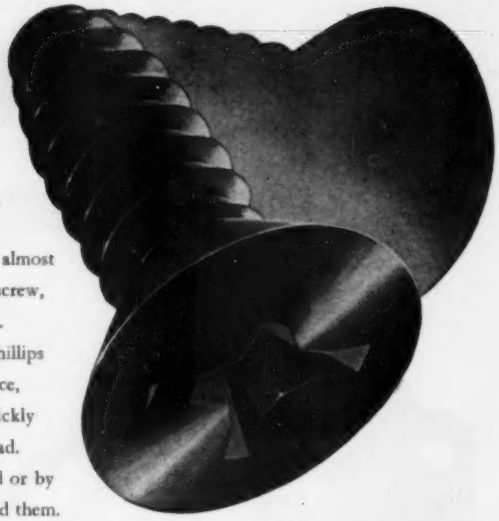

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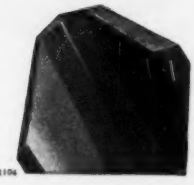

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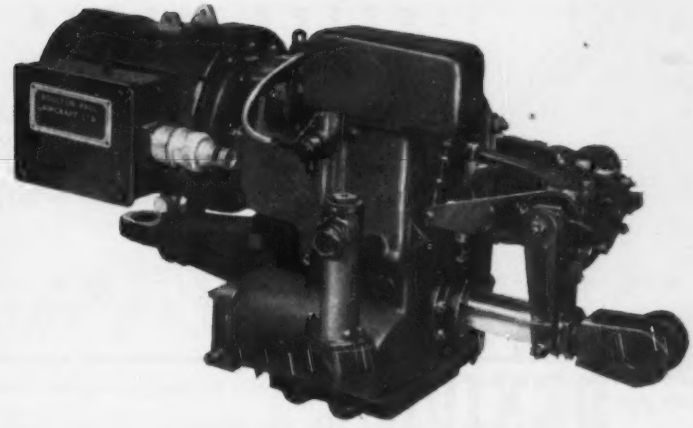

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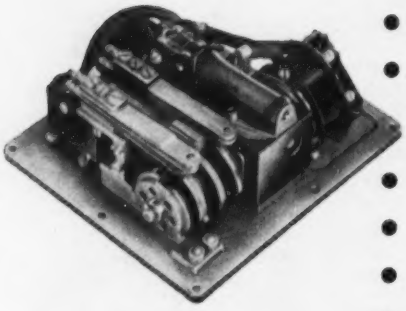

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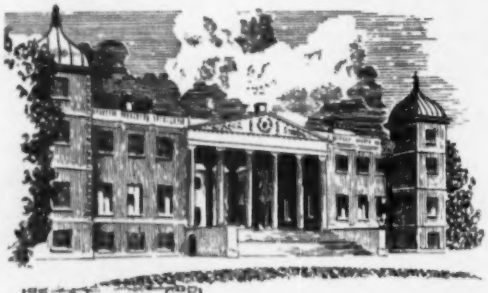

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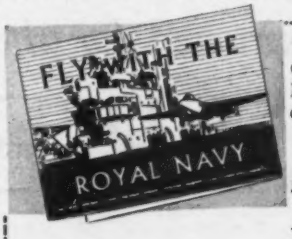

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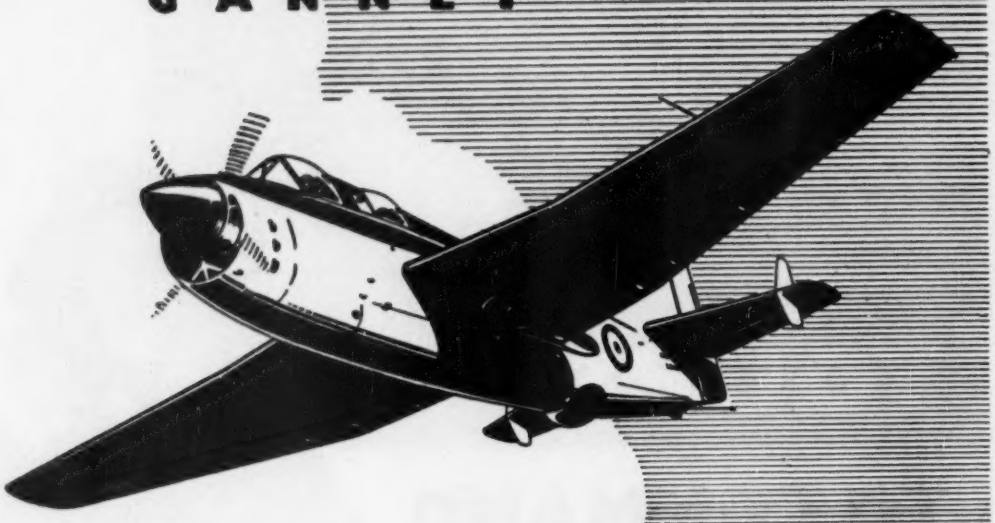

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" . . . not Plated with Gold"

ONE of the most important functions of a technical journal, if not its *raison d'être*, is to provide a platform for the dissemination of knowledge—and under the heading of knowledge we include knowledgeable opinion on controversial matters. Earlier this year a few incidental paragraphs regarding the immigration of aircraft technicians to Canada, and on across the borders to America, resulted in quite a spate of correspondence in our columns. Mainly this indicated that, in the opinions of the writers —representative of both immigrants and those considering immigration—the young qualified engineer is not appreciated, given proper reward for his skill and training, or offered reasonable chances of advancement in the aircraft industry in this country.

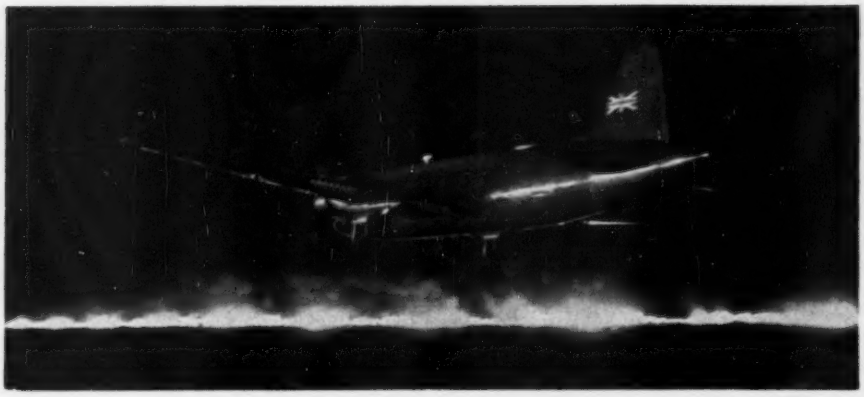
We are satisfied that these are not just the opinions of a disgruntled minority; quite widely held, they are not a little disquieting and they may have a most serious bearing on the future plans of the industry. We may quote Sir Roy Fedden's words to indicate why. He said in the second part of his R. K. Pierson Memorial Lecture (see page 650): "Seldom has there been a greater challenge of the unknown in all branches of aviation. The next six years will produce greater advances, in my view, than the last, and this must inevitably lead on to higher and higher accomplishment, a yet greater increase in the tempo of aeronautical development, and a heavier burden on the aircraft designer and his team. . . . But if we are going to maintain the lead, then of one thing I am certain, and that is we have got to lay down longer range investments in the creation of the right brains, sufficient people with the best possible academic and practical background having good personal qualities and leadership, and possessing aggressive, restless minds. . . ."

Having noted a fairly widespread feeling of dissatisfaction, we have made a point of sounding all levels of the aircraft industry about the careers offered and it seems that certain facts are generally agreed. The first is that aircraft engineering no longer has any magical attraction, if, in fact, it ever had. The head of the Department of Engineering at Cambridge University, Professor J. F. Baker, wrote in the *Daily Telegraph* recently: "We in this country are proud of the development of the jet engine, proud of our Comets and our ships, but we are not as a people excited about engineering and keen to push forward with new methods. Because of our pre-eminence in the past, it is taken for granted that someone will develop the engineering products on which our survival so largely depends. While a devoted band comes forward every year, it is not the accepted thing for our best and most enterprising men to enter industry on the technical side as is the case in America and many European countries." Again, "J.H.W.W." the author of "The Technician's Dilemma" (*Flight*, November 14th) stated: "Unfortunately engineering has never been regarded by the community as a profession on a par with medicine, the law, accountancy, or entertainment."

Secondly, although aircraft technicians—stressmen, aerodynamicists and others—are, naturally enough, keen to better their conditions of living as quickly as possible, they are nevertheless prepared to put up with some hardship provided that they feel their job is worth while, is broadening their experience, and will ultimately lead somewhere. Most would agree with Mr. W. E. W. Petter, who has said: "There are other factors to be considered than a higher material standard of living when planning one's future career, and among these is satisfaction in the class of work one is called upon to perform." On the other hand, the author of "The Technician's Dilemma" finds it necessary to state: ". . . disappointed young technicians are leaving aeronautics for no better reason than that they cannot afford to stay in it. In spite of the popular romance about aircraft, recruitment for the industry is deteriorating both in quantity and in quality. . . . Aircraft are not plated with gold."

We may conclude by referring to still another most important contribution on this subject, namely, the lecture by Lord Hives (*Flight*, October 10th). In this the aircraft industry's urgent need for a fair share of the best brains is clearly brought out and the kind of training and experience required is indicated. But there are many who are still unconvinced about the opportunities and status now offered, and who wonder if the career and the pay justify the long and expensive training. Comparable background and ability should command comparable recognition in any profession.

"FLIGHT" Photographs



After having made one dummy run up the Fido "flare-path" a B.E.A. Viking prepares for its first Fido landing at Blackbushe.

REACTIONS TO FIDO

Practice Landings by Civil Aircraft During a Trial Burn at Blackbushe

LAST week the Fido (fog dispersal) installation at Blackbushe, Surrey, was given a "test-burn" following overhaul by the Air Ministry and prior to being placed on a care-and-maintenance basis. The opportunity was seized by the M.C.A., in co-operation with the airline Corporations, to arrange some trial Fido landings by civil aircraft, and a B.E.A. Elizabethan and Viking, a B.O.A.C. York, and an M.C.A. Dove took part. A number of people were invited to fly in these aircraft in order to test passenger reactions; and they were asked to complete a short questionnaire after landing. *Flight's* representative, who was a passenger in the Elizabethan, writes of his experiences as follows :—

"Driving to Blackbushe airfield to see a fog-dispersal test-burn on a clear cold night was somewhat reminiscent of going to the circus, and, after the brilliant light and warmth had finally died down, the same sort of sadness was felt as when the dimly lighted Big Top empties. For a short time Blackbushe Fido, after years of neglect, had sprung back into life, only to die out, perhaps for ever, in a true blaze of glory. However, in North Country style, the ceremony was followed by a ham tea and liquid refreshment, and inner warmth soon dispelled the cold night air, petrol fumes, and depression."

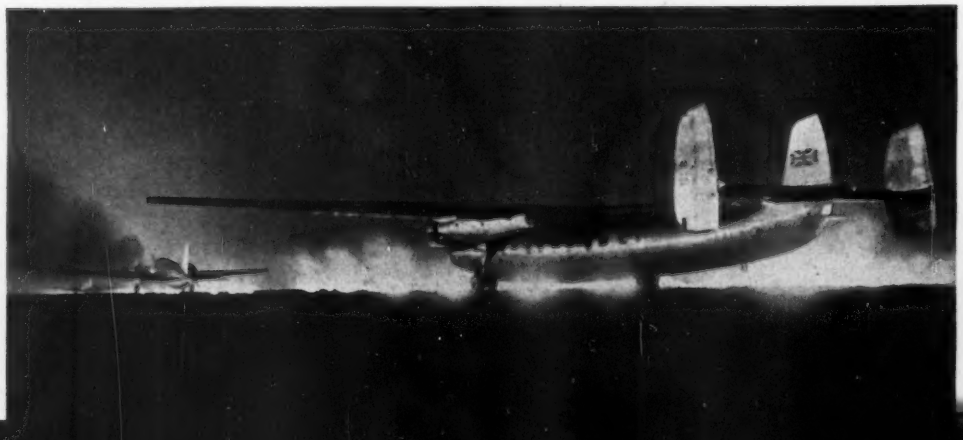
During the short flight, including two circuits, made in the Elizabethan, the following observations were recorded :— "As the aircraft stood at the end of the runway with engines idling, the two bars of flame marking the runway-end behind us and the pilot burners on either side of the runway gave out a bright yellow light. There was little smoke at that time, and, of course, the heat could not be felt inside the aircraft. As the flow of petrol to the burners was increased, new lines lighted up, while others spilled the fuel over the grass so that later, when an attendant airman with a torch persuaded the remaining reluctant sections to blaze, quite large fires producing volumes of smoke were formed for the first few minutes.

"It was perhaps ten minutes before the burners appeared as two fairly regular, almost continuous, lines of fire down the edges of the runway. These lines seemed well away from the aircraft on each side, and passengers were obviously not apprehensive about the proximity of naked flames. The main cabin-lights of the aircraft were switched off in favour of the small individual reading lamps, and as Fido was coaxed up to full intensity the polished aluminium of the aircraft reflected the orange glow. By double reflection from the high-winged Elizabethan's curved flanks the light shone back brightly from the engine nacelles. On the starboard side some of the individual holes in the burners were popping and giving off puffs of smoke and flame like miniature volcanoes.

"The signal to take off came through. The pilot cleared his motors and then started to move off down the runway, and at 6.15 the wheels left the ground and folded forward abruptly into their wells behind the Centaurus engines.

"Once we were airborne and beginning to turn round the circuit, Fido appeared first as a dull red glow resembling that of a dying fire, and there was a good deal of reflection of

Dove, Viking and Elizabethan were three of four civil aircraft used to gain experience of Fido landings. The fourth aircraft was a York.



The Elizabethan standing by for permission to take off is sharply silhouetted by the burners. The flames are not yet at their full height, but are in process of building up to full fuel flow.

light from the smoke clouds formed during the lighting-up. From six or eight miles away the runway looked like two crimson-yellow neon strips with ragged edges. There was no wind, and in this respect the conditions were similar to those usually experienced in thick fog. The black clouds of smoke had moved in a southerly direction and were hanging at circuit height as we flew on the down-wind leg. They were thick enough to obliterate our view of the runway.

"On the approach to land the passengers in the cabin of the Elizabethan at first saw nothing of the Fido burners ahead, but as the aircraft neared the boundary the glow was once more reflected on the silver sides of the nacelles, on the underside of the wings and from the polished surrounds of the windows. Had the blinds been drawn nothing would have been visible of the flames until they were actually passing beneath the aircraft.

"If the particularly timid passenger is, in fact, to feel frightened at any point, it will probably be at the moment of crossing the approach bars at the near end of the runway, for here the warm reflections suddenly turn to lines of ragged flame as the aircraft passes overhead, and at the same instant the heat causes an appreciable bumpiness in the air. Provided, however, that passengers were briefed, it is unlikely that they would have any fear or objection to a Fido landing.

"Once down on the runway the lines of burners on each side gave rather a pleasant, soothing effect after the cold night air above. The very fact that the light from the burners gives "daylight" vision of the runway is very comforting to crew and passengers alike."

The use of Fido for civil operations is still under active consideration but, to quote an official statement, "the technical and economic factors involved in installing Fido at London Airport are very complex, and are being studied in consultation with technical experts and airline operators." In fact, the Air Ministry are waiting to see whether the airlines will pay for Fido; but so far, with the exception of B.E.A., who have indicated a definite interest and made a careful study of the position from their own point of view, no one else has come forward.

B.E.A.'s movements now represent on average at least half of the combined total at London Airport and Northolt, so their share of the cost would no doubt be a large one. However, greater regularity and punctuality, reduction in complete cancellations of services, and, more particularly, a reduction in the fuel reserves now deemed necessary for safe operation on the European routes, may well represent an even greater sum. On the London-Paris run, for example, B.E.A.'s aircraft normally carry enough fuel in reserve to make the return flight to London as well as for holding over Paris before return and again on arrival back at London Airport. A figure of £100,500 per annum has been estimated as B.E.A.'s share of the cost of operating Fido in its present form, assuming 1,200-yard burner pipelines. Farnborough has in hand a development programme concerned with a cheaper system using alternative fuels but still employing the burner and direct-heat-application-to-the-fog principle. This programme is understood to have only low priority, and in view of the Establishment's many other commitments no very quick or spectacular results are to be expected.

The position regarding use of Fido at the moment is that the Manston installation is always available to any aircraft in emergency, but the Minister reserves the right to investigate each case in which Fido is operated. If he is satisfied that it had been a case of genuine emergency, then only the normal landing fee would be charged, but if the investigation showed that the emergency could have been avoided by sound planning or airmanship, the aircraft operator would probably be held liable for the full cost of the operation. The cost of landing one aircraft with the use of the present Fido installation would, according to estimates, vary between £625 and £1,500.

Blackbushe Fido is no longer available except, perhaps, at several days' notice; but, for example, were Manston Fido to become unserviceable for a period of weeks the crew of some seven airmen who look after it could be transferred to Blackbushe, there to prepare the equipment and stand by for emergencies as they had been doing at Manston.

At London Airport such provision as has so far been made for Fido is confined to No. 1 runway and limited to a few foundations for tanks and pipeline channels in the concrete.

It is said that in war-time 2,500 Allied aircraft used Fido for landing—and without difficulty. Fog dispersal became a priority operation quite early in the war after one or two "black" nights during which many aircraft of the all-too-small forces returning from raids over Germany were unable to land due to unexpectedly widespread fog and, as a result, became total losses over friendly territory and waters. The first installation was tested at Graveley in July, 1943, and subsequently other R.A.F. stations—Downham Market, Ludford Magna, Fiskerton, Bradwell Bay, Metheringham, Sturgate, Tuddenham, Foulsham, Woodbridge, Melbourne, St. Eval, Carnaby, Manston and Blackbushe—were equipped.

Blackbushe Fido has only been used once, and this was on November 20th, 1948, when a chartered Viking aircraft took off for West Africa with an urgently needed consignment of currency.

The letters F.I.D.O., from which the war-time Fido is derived, originally stood for "Fog Investigation Dispersal Operations," and it seems that this should be regarded as the official name. In June, 1945, however, an announcement was made that the R.A.F. preferred the title "Fog, Intensive Dispersal Of." This would account for the difference between the official name and what may be called the popular conception.

Previous articles referring to Fido were printed in *Flight* of March 6th, 1947 and May 13th, 1948.

THE DUKE OF EDINBURGH AT CAMBRIDGE

IN his speech at the opening of the new building for the Department of Engineering at Cambridge University, on November 14th, H.R.H. the Duke of Edinburgh said that it would be useless to turn out highly qualified engineers if there were no openings for them in industry. By their wholehearted support for new chairs of electrical engineering and applied thermodynamics no fewer than 40 firms and organizations had demonstrated their faith in the work of the Engineering Department of the University.

"It is essential," he continued, "particularly in a school such as this, where the emphasis is on fundamentals, that the teacher should remain an engineer. The simplest way for him to do this is to engage in applied research which will bring him into contact with industry. In the training of research students, whatever is sometimes said to the contrary, many branches of British industry are now well aware of the need to set up research organizations, and the universities still provide the best training ground for men to staff them."

At the opening ceremony the Duke of Edinburgh was introduced by Marshal of the Royal Air Force Lord Tedder, Chancellor of the University. The new building will later be extended by the addition of an aeronautics wing, with a number of wind tunnels.

FROM ALL QUARTERS

The Hydrogen Bomb?

COMING as it did shortly after a number of published rumours of the "biggest yet" explosion at Eniwetok Atoll, a guarded announcement issued last Sunday by the U.S. Atomic Energy Commission was generally agreed to confirm that the first hydrogen bomb has, in fact, been detonated.

Beginning with the statement that "Joint Task Force 132 . . . has concluded the third series of weapons-development tests," the official announcement went on to say that "the programme included experiments contributing to thermo-nuclear weapons research," and that the scientists had expressed satisfaction with the results. The fact that a reference was also made to Mr. Truman's announcement of January 1st, 1950 (in which the hydrogen bomb was mentioned), and the use of the words "thermo-nuclear" were regarded as confirmation. Nevertheless, a subsequent official statement—last Monday—suggested that people had leaped too far to a conclusion.

During the tests every security precaution seems to have been taken—with the exception of the most obvious : several members of the task force wrote letters home, describing such phenomena as a two-mile-wide flame shooting five miles into the sky, and a whole island vanishing; and these letters were duly published in various newspapers.

Maritime Reconnaissance Britannias

ADDRESSING a meeting of R.C.A.F. ex-Servicemen in Montreal, Air Marshal W. A. Curtis described the Bristol Britannia as "our selection as the best aircraft for what we need —maritime coastal work." He added that by this time next year the strength of the R.C.A.F. would have increased to 50,000 from its present 37,000 men and women. Canada's early-warning system would be "100 per cent operational" by next autumn and the R.C.A.F. would start forming squadrons equipped with Avro Canada Canucks early next year. The entire Canadian Air Division promised to NATO would be in Europe by the autumn.

One of the Air Marshal's most significant remarks was that he hoped that "all Allied bombers will have been converted to a form of V-2 rocket—that is, a pilotless missile" before long. A school for training and research on missiles, he added, would be established at Bonnyville, Alberta, and work had already started on the 100-mile long, 40-mile wide training area.

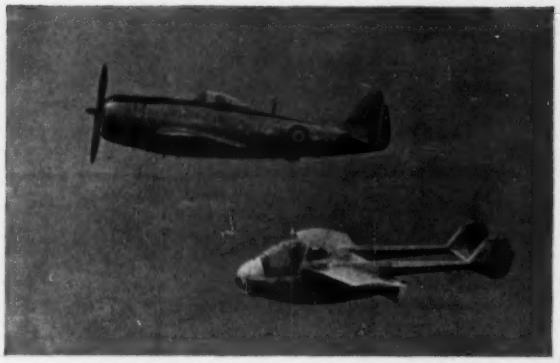
The Angled Deck

"SOMETHING for nothing" can fairly be applied to the "angled deck" procedure of operating aircraft from carriers. This technique—the existence of which was revealed by the Admiralty last week-end—is certain to revolutionize the whole operation of aircraft from carriers, yet it involves a minimum of structural alteration to the carrier itself.

The flight deck is marked out with a landing-path inclined at about eight degrees to the ship's fore-and-aft axis. Landing aircraft follow a conventional approach-path, but come in over the starboard quarter rather than from directly astern. If an aircraft fails to pick up an arrester wire it has a clear overshoot path ahead and can go round again over the port side of the carrier without difficulty. In the rare event of an aircraft losing its hook, or being otherwise unable to effect a normal landing, it can be brought in directly over the stern with the crash barrier raised, as is now accepted practice. But in this case the crash barrier can be sited much nearer the stern, so providing the greater pull-out distance demanded by new types of carrier aircraft.

With the angled deck, barrier crashes should become very rare, so effecting significant economy in carrier operation. Another advantage—apparent from the drawing below—is the manner in which the parking area can overlap the arresting area; in fact, the angled deck has the effect of increasing the operational length of the carrier by 40 per cent. The Royal Navy is thus in the excellent position of having its steam catapult for launching fast and heavy aircraft, together with the angled deck for their acceptance.

The angled deck has been developed principally by Captain D. R. F. Cambell, D.S.C., R.N., Deputy Chief Naval Representative, M.o.S., in association with Mr. L. Boddington, of the R.A.E., Farnborough. Preliminary trials of the layout have been conducted by the Royal Navy and the U.S. Navy—where it is known somewhat misleadingly as the "canted deck."



MINIJET is the name now applied to the S.I.P.A. 200 light jet-propelled two-seater, demonstrated on November 12th at Toussus-le-Noble and seen here in company with a Republic Thunderbolt. With its span of 23ft the Minijet is one of the world's smallest aircraft. It is claimed to cruise at 225 m.p.h., to have a range of 350 miles, and to possess "aerobatic certification." Take-off run is quoted at 1,000 ft.

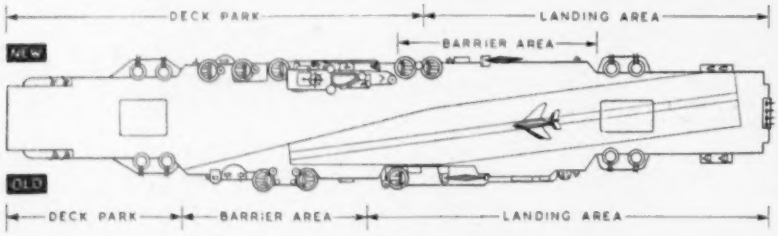
Rolls-Royce £2¼ million Issue

IT was announced last Monday that Rolls-Royce, Ltd., are shortly to offer Ordinary and "workers stock" shareholders 933,334 shares of £1 each at 50s. a share (market price of existing shares is 61s 6d). As explained by Lord Hives in an accompanying statement, the company is committed to establishing facilities overseas for the maintenance of Rolls-Royce aero engines—including facilities in Canada, which could be expanded, if necessary, for the manufacture of the Nene turbojet and spares (this power unit is being installed in the Lockheed T.33 trainer, for which Canadair, Ltd., hold a licence). Lord Hives also remarked that the existence of overseas factories would be of the utmost value to users of the company's engines : these would now include operators of Comets and Viscounts in America, Australia and France, as well as in Canada.

Plastic Light Aircraft

A NOTABLE Paper was read before the Plastics Institute in London on November 13th. Although, as indicated by the title (*The Future of Plastics in Engineering*), it covered a wide field, certain sections were of considerable aeronautical interest, especially as the author was Mr. J. E. Gordon, B.Sc.(Glas.), famed for his work on plastic aircraft structures at the R.A.E. The Durestos (asbestos felt impregnated with a phenol-formaldehyde synthetic resin) delta wing, it will be remembered, figures in this research.

Examining in the course of his lecture the value of plastics *vis-à-vis* the more orthodox structural materials, Mr. Gordon pointed out that to use simple mechanical properties as a criterion



THE ANGLED DECK (see col. 1) laid out on a typical British fleet carrier with the approximate subdivision of deck-space indicated above (angled deck) and below (conventional). The aircraft in this "Flight" drawing is copied from a model depicted in an Admiralty news-release on the angled deck; it represents no particular projected type.

Safe arrivals—The operation of modern high speed aircraft has shown the need for an omni-directional aid which will provide direct bearing information within the aircraft, exclusive of communications facilities, and a performance practically unaffected by the prevailing atmospheric conditions. Marconi V.O.R. equipment will fulfil this important requirement.

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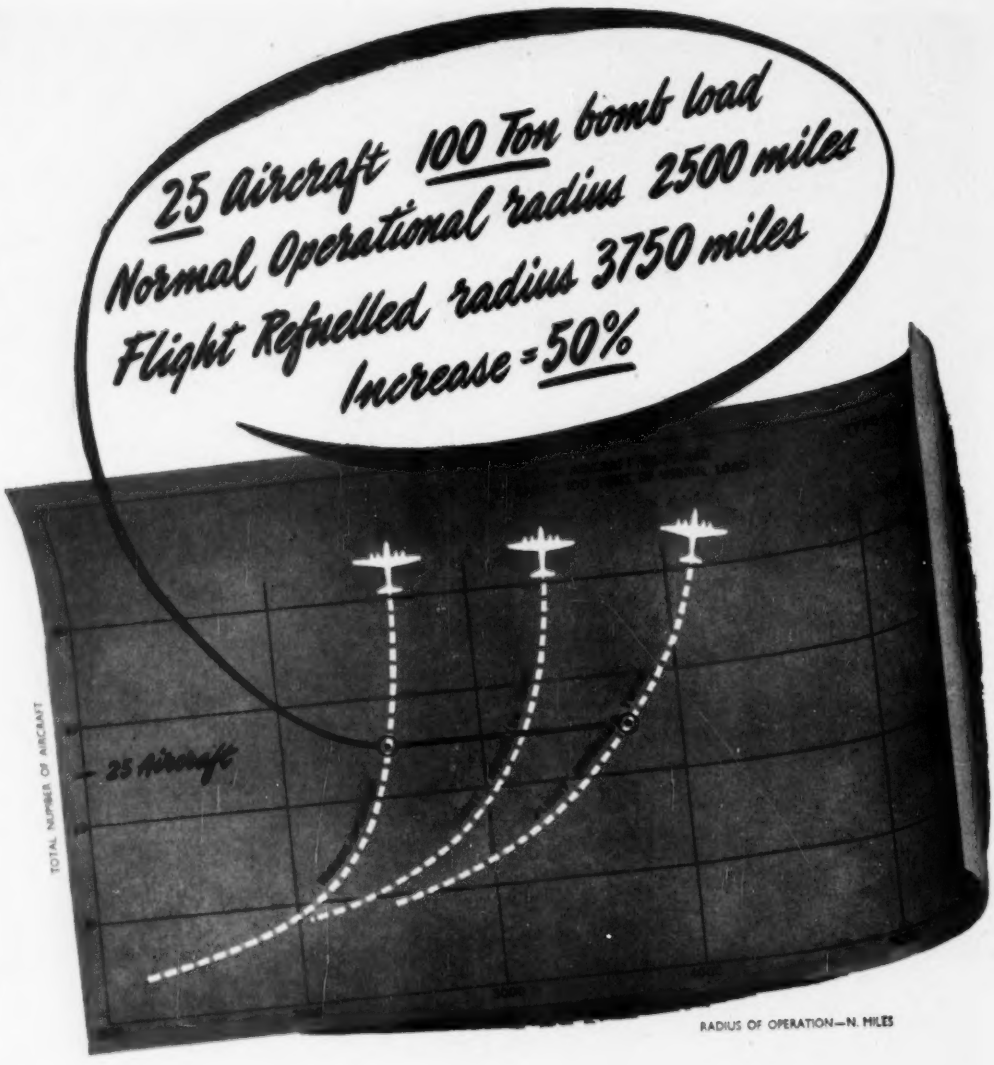
25 aircraft 100 Ton bomb load
Normal Operational radius 2500 miles
Flight Refuelled radius 3750 miles
Increase = 50%
TOTAL NUMBER OF AIRCRAFT
25 aircraft
RADIUS OF OPERATION—N. MILES

The practical, *immediate* potentialities of refuelling in flight have been demonstrated by the rapid refuelling of military jet aircraft while flying at high speed. Today, highly developed far beyond the experimental stage, flight refuelling is a simple, economical method of substantially improving the range and useful load of both military and civil aircraft. As an example, one of the vitally important aspects of this question—radius of operation — is indicated in the above graph. The advantages of flight refuelling, together with their bearing on present conceptions of effective air power, are strikingly apparent.

The Pioneers of Refuelling in Flight and Pressure Refuelling

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SUPERSONIC ELEGANCE: Some may argue that a weapon of destruction can never be a thing of beauty; nevertheless, there is aesthetic satisfaction in every new flying picture of such aircraft as the Hawker Hunter. Here, for the first time, the makers have released an aerial plan-view (of the first prototype) thus revealing another pleasing aspect of this graceful machine. It is learned that both Neville Duke and A. W. Bedford have flown the Hunter at supersonic speeds—on occasions, in steep dives, at appreciably above Mach 1, it is believed.

FROM ALL QUARTERS . . .

of efficiency could be misleading: we might come to the conclusion that, simply as a material, Durestos was only half as efficient as Duralumin; yet "by being cunning you can make structures from Durestos which are about as efficient as Dural ones," and it followed that the efficiency of shape in the plastic structure must be something like twice as high as that of a "Meccano" component, i.e., one fabricated from separate sheets, angles and so on.

Discussing present and likely future developments in plastic materials, Mr. Gordon spoke hopefully of the use of metals in conjunction with plastics; it was now possible, he said, to get really first-class adhesion between steel and Durestos if the two were moulded together. Durestos-shell structures could be made with steel inserts in the more highly stressed places, the plastic material also providing protection and a smooth finish, and helping to stabilize the steel.

Coming specifically to the subject of aircraft, Mr. Gordon said that, leaving military aeroplanes aside, profitable experience in plastics construction was most likely to be gained upon the light, private-owner type of machine. He believed the cost of building airframes was in the region of 50s per lb finished weight; Duralumin was about 3s per lb, the difference mainly lying in cost of fabrication. For a 600-lb airframe one was faced with an expenditure of about £1,500 before providing an engine and instruments.

Cuts sufficient to justify quantity production must be made chiefly at the expense of the airframe. An attractive target seemed to be a structure-cost between 10s and 15s per lb; this might reduce airframe cost to £300-£400, and take £1,000 or so off the cost of the aircraft. This probably called for a material-cost of 5s to 7s per lb, and at such prices there were plastics available that were technically suitable. Low wing-loadings, however, led to low structure-loadings, and hence to the need for thin panels. These might have to be stabilized by a "foamed-in-site" plastic at a cost of about 15s per lb, and a lot of it would be needed. Such a project, therefore, might at present be regarded as just about marginal; but a relatively small reduction in cost might make it economically attractive.

Saying that, technically, there did not seem to be any insuperable difficulties, the lecturer then went on to cite some of the advantages, including reduction of drag, the elimination of the necessity for periodical examination of internal structure-details, and the fact that fatigue was unlikely to be a serious problem.

"I do not know if we shall ever see the quantity-produced light aircraft," said Mr. Gordon, "but, if so, I think it will have to be made in plastic."

MERIT REWARDED: Mr. Richard Fairey, a director of his father's company, hands over an award at the annual prize-giving to apprentices, reported on page 654. The recipient in this picture is R. E. De'Ath.

The C.A.S. on the Merchant Air Fleet

SPEAKING at the anniversary luncheon of the Institute of Transport, in London on November 12th, Marshal of the Royal Air Force Sir John Slessor, Chief of the Air Staff, made a strong appeal for the building up of Britain's Merchant air fleet. There was a vital need, he said, for transport to enable us to move troops quickly to the scene of troubles. "But we cannot hope to do that by military transport alone," he continued. "We must always have a hard core in Transport Command for the sudden urgent troop movements in bulk. But we must look to civil air transport to supplement us, whether in cold or hot war."

Saying that, even now, the Services had put out civil air contracts for over 100,000 scheduled troop-movements a year—in addition to about 17,000 Transport Command schedules—the Chief of the Air Staff added that, in building up the Merchant air fleet there was an urgent need for more modern air craft-types to replace the improvised transports that had been in use for so long. "But," he said, "we must not expect too much too quickly. We cannot expect to see in the near future great fleets of really modern air transports that we can call upon in any emergency for the large-scale movement of troops."

"It is not far wrong to say that two long-range jet transports, with two more in operating reserve—at a capital cost perhaps under £1,000,000 at a reasonable rate of utilization—will lift more troops in a year between the U.K., Middle East and Far East, and lift them rather more cheaply, than two of the latest troopships at a capital cost perhaps £9,000,000."

Another speaker at the luncheon was Mr. Lennox-Boyd, Minister of Transport and Civil Aviation. Speaking of the enormous increase in transport speeds, he remarked that when Sir Robert Peel came back from Italy in 1830 to be Prime Minister it had taken him a fortnight—the same time as it had taken a Roman emperor. "When our Prime Minister came back recently from the South of France," said Mr. Lennox-Boyd, "it took him three and a half hours in an aeroplane—and for much of that time he was in charge of the machine. No passenger was disturbed at the thought."

Mr. C. T. Brunner, president of the Institute of Transport, made the suggestion that in Coronation Year a Comet should be sent on a world trip, carrying samples of British craftsmanship.

HERE AND THERE

C.A.S.-Designate in America

A NINE-DAY visit to the United States is the next item in the itinerary of Air Chief Marshal Sir William Dickson on his way back from his Far Eastern tour. He was due to arrive at Travis Air Force Base, California, last Monday, and to visit Los Angeles, Fort Worth (Texas), Offutt Air Force Base (Nebraska), Wichita (Kansas), and Washington, D.C., before leaving for Ottawa on November 26th. Sir William is to succeed Sir John Slessor as Chief of the Air Staff on January 1st.

Westland's First 55

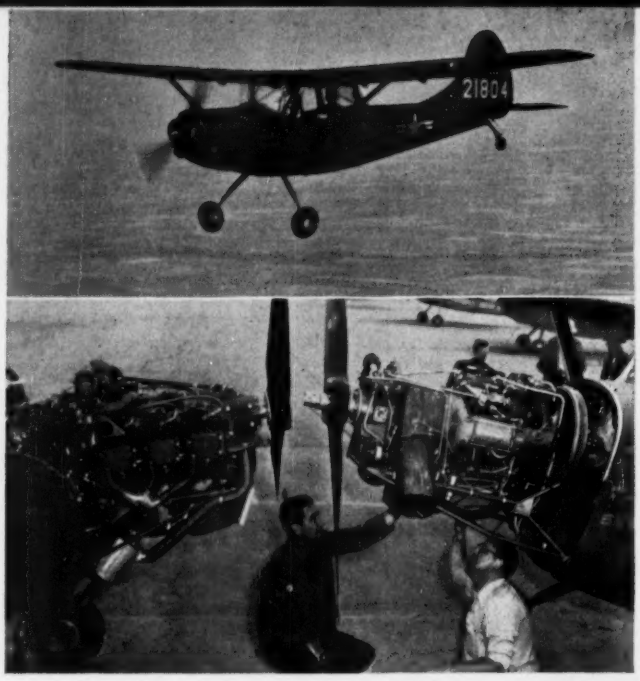
IN less than two years since the licence was obtained the Westland Company have built and flown their first W.S. 55 helicopter—the first flight took place on November 12th. A second machine is expected to fly next week and two more before the end of the year. The first three will undergo makers' tests and trials at Boscombe Down before being delivered to the Navy. The fourth machine will be retained by the company for further trials. Production at Yeovil is expected to be one aircraft per week from April. W.S. 55s are being built to Navy and R.A.F. orders. The transmissions have been produced at de Havilland's Lostock factory.

Supersonic Parachutes

INTENSIVE research work is being undertaken by the G.Q. Parachute Company and the Ministry of Supply in the development of parachutes used in guided missile experiments. The requirements are formidable: such a parachute is not merely required to return recording-equipment to earth, but in some cases may have to check the missile itself, stabilize it, and bring it to the ground intact. The research programme now in hand calls for full-scale air tests, since no supersonic tunnel is large enough to take the canopies involved. Though no details of the methods used have been released, it is believed that a number of successful releases at supersonic speeds have already been made.

First Turboprop Lightplane

THUS described is the Cessna XL-19B Bird Dog liaison aircraft, which, since November 5th, has been flying with a Boeing Model 502-8 gas turbine. It is a joint Cessna/Boeing/U.S. Army/U.S.A.F. development, and the engine is described as an outgrowth of a joint Boeing/U.S. Navy programme of several years' duration. Mr. Hank Waring, who made the first flight, reported control characteristics as good as those of the standard piston-engined L-19A. Modifications occasioned by the turboprop installation included additional air-intake ducts and a new oil-radiator support. A standard two-blade McCauley metal airscrew, with a slightly modified pitch, is employed. A saving of some 124 lb of power-plant weight has resulted from the installation of the Boeing 502, the weight of which is about 250 lb.



TURBOPROP LIGHTWEIGHT: The Cessna XL-19B and—lower picture—a comparison between the standard Continental O-470 (213 h.p. for take-off) piston-engine installation and the 210 h.p. Boeing 502 turboprop. (See "First Turboprop Lightplane," on this page.)

The unit is rated at 210 h.p. for take-off and has a cruise rating of 175 h.p. Suitable fuels are diesel oil, any grade of automotive fuel, U.S. Army standard truck fuel, high-octane aviation spirit, or JP-3 or JP-4 jet fuel.

Death of Air Attaché

WE regret to record the death of W/C. D. H. Fleet, M.B.E., which occurred in Helsinki on Sunday last following a heart attack. W/C. Fleet, who was 57 years of age, had held the post of British Air Attaché in Helsinki since October, 1947.

Bringing It Home

THOUGH long-distance flights by owners of light aircraft seem to be out of fashion at the moment, at least one such journey is now in progress. In a Miles Whitney Straight which he recently purchased, Mr. Peter G. Nicholas is flying from Britain to his home in Kenya. His flight-plan for the 4,500-mile journey provides for 27 stages. Carried in the aircraft is what a publicity agency describes (euphemistically, we suspect) as "a model of a new British sanitary engineering export invented by a Scotsman for use in areas where there is no main drainage."

Canadian Appointment

CLOSELY associated with the U.S. aircraft industry for the past 35 years, Mr. Val Cronstedt had been appointed director of engineering of the A. V. Roe Canada gas turbine division, where he will be closely concerned with the production of the Orenda. Mr. Cronstedt was chief engineer at Lycomings for ten years and executive engineer of Pratt and Whitneys for 13 years. During the last two years he has been consulting engineer to the Swedish aircraft engine industry. It is stated that he is discontinuing this work because of "the Swedish decision not to develop aircraft reaction engines of their own design." This appears to confirm recent Swedish newspaper reports to the effect that the Stal company is discontinuing work in this field. Last year A.S.T., Ltd., modified a Lancaster for testing a powerful new axial-flow turbojet in Sweden.

Enquire Within

COPIES of the index to the January-June, 1952, Volume of *Flight* are available at 1s (1s 1½d by post), or at 6s (6s 5d) with binding case, from Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

Honour for Jimmy Doolittle

THIS year's winner of the Wright Brothers Memorial Trophy—a 12in-span replica of the original biplane—is General James H. Doolittle, the veteran pilot who led the famous U.S.A.A.F. attack on Tokyo ten years ago. The award marks Gen. Doolittle's "significant public service of enduring value to aviation."

More Wright Sapphires

A LARGE order for J-65 (Armstrong Siddeley Sapphire licence) turbojets to power "secret new Navy interceptors" is announced by the Curtis-Wright Corporation. This selection marks the first installation of the Sapphire in aircraft for the U.S. Navy. Production of these British-designed turbojets is already under way for Republic F-84F Thunderjets and Martin B-57 Canberras.

London Airport Strike Threat

AN unofficial strike is threatened at London Airport over the forthcoming transfer of B.E.A. engineers from Northolt. Some of the Northolt men are members of the Aeronautical Engineers' Association, which is not affiliated to the T.U.C., and a number of members of affiliated unions at L.A.P. have refused to work together with Ae.E.A. men. A meeting of the engineering and maintenance panel of the National Joint Council for Civil Air Transport, on Monday last, failed to find a solution to the problem.

AN artist's impression of a night scene at the Esso Refinery at Fawley—the largest in Europe—where aviation turbine fuels are now being produced for the United Kingdom.

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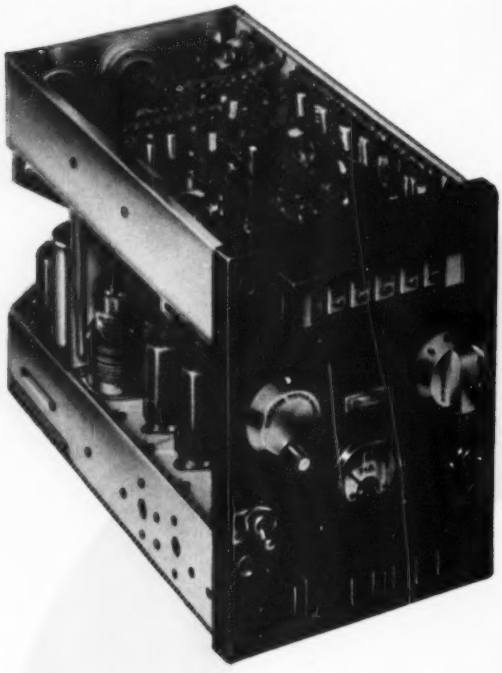

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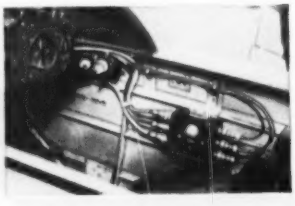
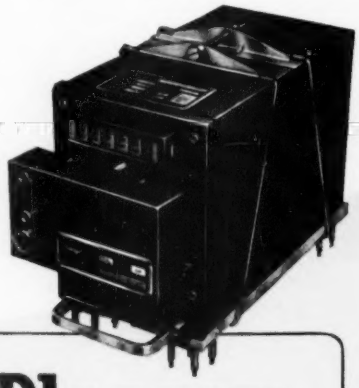
Type PTR 61

The PTR 61 provides VHF R/T communication on six crystal-controlled channels in the 116-132 Mc/s band. The expected range of 50 miles at 3,000 ft. is often exceeded in practice. Three alternative forms of control — simultaneously tuning receiver and transmitter — can be provided at remote or local positions.

- *Power consumption approximately 55W.*
- *All-up weight including cables 17 lb. (24 lb. with remote control).*
- *Crystals and channel frequencies can be changed in flight.*
- *Intercommunication facilities at up to three positions.*
- *Fully tropicalised.*



Part of dual installation for instructor and pupil on D. H. "Chipmunk."



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ALUMINIUM as an AIRCRAFT FUEL

An Appraisal of a Familiar Metal in a New Rôle

THE technique of coating surfaces by spraying them with a jet formed from diffused particles of molten metal is widely employed in many industries. Chiefly an anti-corrosion process, it involves the air-spraying of flaked powdered metal—usually aluminium—through a low-temperature flame which melts, but does not burn, the powder. It has long been appreciated that aluminium is, potentially, a fuel in its own right—and one with some striking properties. The following review of the subject has been prepared from a lecture given in the United States by Dr. A. C. Schweik, Ph.D. Brief biographical notes upon Dr. Schweik and of two other pioneers in this field are given at the end of the article.

ALUMINIUM entered, or rather began, the science of metal calorics in its application to welding processes; powdered aluminium is a major constituent of Thermite, in which its high-temperature combustion is used to the full. During 1910, patent claims were filed for the air-spraying of aluminium for protective-coating purposes; one of these patents—by F. C. Ucar of Spain—involved the use of an arc struck between aluminium electrodes.

Aluminium is readily combustible when powdered, but difficulties were faced in the development of a suitable "fuel system." M. F. Offner, Sc.D., D.Eng., was one of the American pioneers of aluminium-burning power-plants, and one of his first experiments was the fuelling of a diesel engine with oil-emulsified aluminium. (Emulsified aluminium is, in fact, best known in Great Britain.) A later development was the use of fed-in aluminium wire, and both temperatures and mean effective pressures have been obtained exceeding those possible with liquid fuels. In small plants, high efficiencies have been recorded.

The ultimate aim, now being examined, is the full combustion of solid aluminium. This can be achieved only by atomizing the metal in its own flame. Compact aluminium is at present available as rod, sheet, ribbon, or wire, and is generally of such high purity as to be costly and fairly scarce. Second-grade metal costs half as much, and still poorer grades would be quite suitable for use as fuel. But metallic fuel is still a costly product; one ton of aluminium burnt to deliver 3,000 lb thrust would be consumed within 40 minutes, although stationary and vehicular engines could conceivably recover the oxide to effect a significant economy.

Other factors enter the picture to present aluminium in a more favourable light. Stockpiling is simple, and the solid metal cannot deteriorate; in fact, it is not even hygroscopic and can be stored in the open—a practice impossible with all other propellants. Emulsified in liquid fuels, aluminium gives excellent results, but this combination has lost its original appeal, for it is a costly one, and the suspension begins to settle after a few weeks.

Although liquid fuels are today more popular, this family of propellants cannot match the high detonation-pressure and directional-impulse effect (e.g. the "hollow charge") possible with solid fuels. Much pioneer work on fuels of this type—other, of course, than the simple gunpowder which figured in the early and pyrotechnic histories of rocketry—was done by Dr. R. H. Goddard, a biographical note on whom appears at the end of this article. Today the design of very large aluminium-burning power plants is being studied, and the large supply of fuel required by such motors appears to be assured by the extraction by atomic energy of the metal from abundant aluminium-bearing clays.

The difficulties of atomic propulsion of aircraft have more than once been assessed in the pages of *Flight;* Dr. Schweik considers that aluminium fuels will bridge the gap between contemporary liquid fuels and nuclear reactors. He gives three reasons for this opinion.

(Left) Dr. R. H. Goddard, whose work on solid propellants laid much of the ground for the present research.

(Right) M. F. Offner, who, working in America, has had considerable success with aluminium as a fuel for I.C. engines.

First, aluminium has a specific gravity and heat content some four times that of typical hydrocarbons. Existing types of aircraft could, if redesigned to burn aluminium, employ wings with more sweepback and less area. A flat coil of wire weighing almost a ton could, according to Dr. Schweik, be stored in a very thin wing.

Secondly, the use of the same aluminium fuel for both turbine and rocket propulsion confers interchangeability and flexibility to aircraft in which both types of power-plant are fitted—one for cruising and the other for climbing and emergencies. This assumes the elimination of the present pressure-variation, or coughing, characteristic of reaction jets using powdered aluminized fuel. Dr. Schweik also reminded his audience that present-day jet aircraft—in the United States—were fuelled with synthetic chemical mixtures bearing little resemblance to "cheap" turbine fuels of but a few years ago.

Finally, aluminium burns almost equally well with either air or an oxidizer, and so holds promise of use both at very high altitudes and at "sub-radar" altitudes near the ground, where the dense air favours the ramjet and its various techniques of thrust augmentation. Bringing together these two modes of propulsion, related in principle but separated by a present difference in fuel, would further the development of an aircraft more versatile than one powered solely by a rocket or an athodyd, without attempting to replace the slower turbine-driven aircraft.

THREE WORKERS IN THE FIELD

Dr. R. H. Goddard (1882-1945) devoted much of his distinguished career to the development of high-energy solid propellants for rockets and, later, for what came to be termed reaction motors. It was to commemorate the seventh anniversary of his death that Dr. Schweik's lecture was delivered.

M. F. Offner, Sc.D., D.Eng., was, during the 1930s, a lecturer at the Swiss Polytechnic Institute, under the late Aurel Stodola, a well known gas-turbine technician and a consultant to Brown, Boveri and Co. Since that time, he has been doing research into the combustion of aluminium as a fuel. He became closely identified with its jet-propulsion applications and with aircraft design when, early in the war, he was connected with a Seattle laboratory engaged in consulting work for Boeings under W. W. Offner, a physicist.

Dr. A. C. Schweik, Ph.D., whose lecture is summarized above, has been mainly connected with physical metallurgy. Since the end of the war, as a consulting engineer in New Jersey, he has been specializing in powder metallurgy. He acted as an assistant to M. F. Offner from 1943 to 1946.

SUPER-PRIORITY: A COMMONS EXCHANGE

IN the House of Commons on November 10th, the Minister of Supply was asked questions concerning the production of the Fairey Gannet. Mr. Callaghan (Lab., Cardiff) wanted to know what effect the super-priority given the Gannet was having on its production and when the Royal Navy could expect a reasonable flow of these aircraft.

In reply, Mr. Sandys said that super-priority had proved most helpful, particularly in regard to the supply of materials; it would not, however, be in the public interest to publish forecasts of deliveries.

Mr. Callaghan then asked if the Minister was aware that there was widespread criticism to the effect that super-priority was creating more confusion than it was aeroplanes; and was he proposing to make any amendment to the present arrangements? To this the Minister replied that he thought such criticism came badly from Mr. Callaghan, who knew very well that the reason for the delay in production of the Gannet was that under his administration at the Admiralty it was entirely redesigned, with the result that the production order for the aircraft was only placed by the late Government last year.

Mr. Callaghan said he was not discussing that question, although he would be glad to so so; what he was asking was whether super-priority was giving any help, since the allegation was that such was not the case. Mr. Sandys said he had already given the answer in stating that super-priority had proved most helpful. The Member for Cardiff retorted that this did not help very much. But the Minister had the last word: "The Honourable Gentleman refused to give similar information last year," he said.

Our American Correspondent Reports . . .

CONSIDERING the overwhelming effect of the American elections on the Press of the United States, the news that PanAm had bought three Comets got very adequate coverage. Half-expected by the aircraft industry, though perhaps for a later date, it was received by manufacturers and general public with good enough grace. Coming as it did so shortly after Capt. Rickenbacker's rather sour comments on British production, the news also helped to put things back into perspective.

The newspaper reports confined themselves pretty well to the wording of the announcement, but some covered the event with editorial comment. The *New York Times* conceded that it was unlikely that any other jet transport would be available before 1956 and pointed out that the American operators could not be left behind in the matter of equipment, adding : "Pan American has expressed continuing interest in the proposed American planes, but the fact remains that the British have turned out the first jet airliner to go into regular operation. And out of economic necessity an American airline has been forced to buy it."

The New York *Daily Mirror* headed its editorial, "Britain Out-jets Us," and went on to say that Pan-American were forced to buy British because there was nothing else. But it then added, "Britain has been able to develop jet transports because she got a head start in this field, holds superior patents, writes off huge experimental costs on a nationalized basis, and has a ready market in the nationalized British Overseas Airways Corporation. Also military contracts have demanded a disproportionate amount of the energies of U.S. manufacturers : probably in ratio to the disproportionate commitments of our country in Korea as compared with other members of the U.N. Americans naturally do not believe in nationalization. . . ."

But the most balanced leader appeared in the *Christian Science Monitor* of October 23rd. "A good competitor," it said, "knows how to congratulate a winner as well as how to carry off trophies himself. The American aviation industry, therefore, can well be genuine in its tribute to British aeronautical and power-plant skill. . . . This is the kind of enterprise Britain must show . . . if it is to win the hard economic battle which current world circumstances impose upon it. . . . Here is competition in which the traveller and ultimately the world at large is the gainer."

Later on there will undoubtedly be further comment from the industry and, after the election, perhaps from Congressional circles as well. In the meantime all those with whom this correspondent has spoken are "genuine in their tribute." All in all, it has been a very satisfactory time.

• • •

RATHER naturally, the Comet news has brought out a large number of statements on what the American manufacturers propose to do. Heading the parade is Boeing. Some weeks ago that company surprised people by saying they would have a new prototype of jet aircraft available for demonstration in the summer of 1954. Considerable credence is now being given to this statement. Designated the Boeing 707, the aircraft is rumoured to be a development of their military tanker—modified for civilian use as an 80-passenger low-wing aircraft with about 35 deg of sweep. Presumably the engines will follow the standard Boeing pattern and be in pods, and the most likely power units would be the Pratt and Whitney J.57. This layout isn't too far off the "Basic Specification for U.S. Jet Transport" which, issued by the American Air Transport Association, called for 70 to 80 seats (four abreast), a cruising speed of not less than 550 m.p.h. and a range of between 2,000 and 3,200 miles. Among other requirements was a limitation of landing runway for domestic use of 5,500ft at 30 deg F without the use of trick arresting gadgets such as parachutes or airport arresting-gear. One point of interest is A.T.A.'s insistence that fuel be stored outside the fuselage and that, in the event of a crash landing, the undercarriage should be capable of being wiped off without damaging fuel tanks or lines.

Obviously, not all the A.T.A. suggestions—and the above are only a few chosen at random from a comprehensive list—will meet with the manufacturers' approval. But there are strong indications that a definite attempt will be made by both the Government agencies and the Air Transport organizations to use this jet-development era to introduce a number of features which either the manufacturer or the operator has been unwilling to accept on reciprocating-engined types. Whether the manufacturers will also demand some relaxations in the airworthiness requirements, examinations and flight testing remains to be seen. But such a step is likely. The actual proposals put forward by the A.T.A. included the following abbreviated specification :—

Cost per ton-mile*	Equal to DC-6
Cruising speed	550 m.p.h.
Range, domestic	2,000 miles
Range, international	3,200 miles
Runway length, domestic	5,500ft
Runway length, international	7,500ft
Fuselage width, inside diameter†	128in
Cabin aisle headroom	80in
Passenger capacity, first class	70-80

*Direct cost operated at 20-30,000ft (necessary on shorter hauls or against adverse-wind gradients) should be comparable with costs of existing types of the DC-6 and Connie series.

†The 128in cabin-width must be constant (no taper), to make possible five-abreast seating for air-coach use.

• • •

THE new helicopter postal service around New York City was started last month. Unfortunately, the weather was very poor on the day chosen to inaugurate the service and, although the Sikorsky S-55—which is designed to carry 1,200 to 1,300 lb of mail—took off from La Guardia, it was forced to return before it reached Newark. After the S-55 had stopped at Idlewild to pick up load the ceiling came down to 700ft and the visibility dropped below the required minima. On this particular service these are 1,500ft altitude and two miles horizontal visibility and, although at first sight these limits may seem to be rather severe for helicopter operations, it must be remembered that all the legs of the triangular course between La Guardia, Idlewild and Newark are over heavily populated areas and also across sections of the city which are already very sensitive about low-flying aircraft of any sort. Furthermore, the whole of the route is within a control area in which the approach patterns to one or other of the airports may lie. But, New York local weather being what it is, it would seem that some very careful route-patterning will have to be developed in order to avoid the worst of the built-up areas and yet allow the service to operate during the winter weather.

There is, of course, plenty of helicopter flying going on around New York apart from the new mail service. The Police have such aircraft, as well as the Port Authority, and the Coast Guard use a large number for patrol and rescue work. In this latter respect helicopters do a particularly good job in rescuing stranded or waterlogged fishermen or wildfowlers, or people lost in the marshes; and in summer there is a steady business in spotting—and sometimes picking up—small boys who have launched themselves into one or other of the local rivers on home-made rafts and been stranded or swept out into open water.

• • •

IN the October issue of *Planes*, the official publication of the Aircraft Industries Association, Admiral Emory Land, president of the Air Transport Association, gives some A.T.A. forecasts of air traffic expansion over the next eight years. It is the Association's opinion that by 1960 the United States scheduled air lines will be carrying more than 45 million passengers, an increase of about 84 per cent over 1951. Passenger-miles, they think, will go up by 92 per cent to

some 25 billion, and the carriers, both domestic and international, will haul more than 127 million ton-miles of mail and 478 ton-miles of cargo. Most of this work, they think, will still be done by piston-engined transports, and the impact of jets, on the domestic market anyhow, will be small.

This does not mean—in the writer's opinion—that there will be no turbine transports operating in the States, but the operators here have some 287 as yet undelivered piston-engined aircraft on order, to a value of over 250 million dollars; and they will have to use these up before turning their whole attention to the newer types of power plant.

Admiral Land makes a particular point of emphasising the expected increase in cargo flying, but at the moment only about eight all-cargo aircraft are on order. This is probably due to the fact that no real cargo machine has yet got into production—for civilian use at any rate—and the eight aircraft mentioned above are either DC-6s or perhaps cargo versions of the Super-Constellation, both of which are long-range types. As the DC-3 and C-47 short-haul cargo conversions become obsolete, something will have to take their place, and already such companies as Slick Airways and Flying Tiger Line are wondering what they will do. The following table gives the Air Transport Association estimates.

Year	Revenue Passengers	Passenger-miles	Mail Ton-miles	Cargo Ton-miles
Domestic carriers:—				
1952 ...	26,190,000	12,257,000,000	70,232,000	237,775,000
1955 ...	32,630,000	15,500,000,000	84,278,000	291,000,000
1960 ...	41,250,000	19,800,000,000	99,440,000	370,585,000
International carriers:—				
1952 ...	2,333,000	3,047,000,000	22,629,000	77,673,000
1955 ...	3,003,000	3,934,000,000	24,666,000	89,908,000
1960 ...	4,174,000	5,510,000,000	28,119,000	108,000,000

JERRY SHAW RETIRES

ON reaching the retirement-age of 60 on November 17th, Jerry Shaw—or, to give him a more formal mode of address, Capt. Henry Shaw—retired from his position as aviation representative of the Shell Petroleum Co., Ltd. A "Lancashire lad," he was born on November 17th, 1892, and educated at Hulme Grammar School, Manchester. He flew the very first commercial airline flight in the world—from London to Paris on July 15th, 1919, when he was the chief (and only!) pilot of the newly formed air line, Aircraft Transport and Travel, Ltd.

After his early schooling in Manchester, Jerry came to London to work and was early attracted to aviation. He had his first flight in a Blériot monoplane in June, 1912, and when war came he learned to fly at Hendon in a Grahame-White "Box-kite." Then he joined the R.F.C. and saw service in France.

Immediately after the Armistice, the R.A.F. formed the Communication Squadron for the purpose of carrying high-level delegates and mail to the Peace Conference in Paris. The squadron operated first from Hendon (and later Kenley) to Buc and Le Bourget, using D.H.4as and Handley Page 0/400s. Jerry was one of the first pilots selected for this Communication Squadron and thus became very familiar with the route at a period when all such cross-country flying was entirely "Bradshaw".

On April 1st, 1919, George Holt Thomas, the founder of Airco, Ltd., formed A.T. and T. as a subsidiary firm to run an airline between London and Paris. Holt Thomas chose Jerry as the first pilot of A.T. and T. and delegated to him the job of picking other pilots. This is Jerry's own account of how he started his historic flight, in an Airco D.H.9:—

"On July 14th, 1919, whilst I was at Hendon with the impatient nucleus of A.T. and T. the daily newspapers carried a very short announcement that as from the following day civilians would be permitted to fly outside the country. I first became conscious of this momentous relaxation when the afternoon poker school was interrupted with the announcement that some enthusiast wished to fly to Paris the following morning. As I learned the way to Paris on special jobs . . . the job automatically came to me.

Jerry Shaw, photographed at Hounslow after piloting a D.H.16 from Paris in 1919. "Flight" photograph

"My briefing consisted of being told that a Major Pilkington had chartered a machine to take him to an urgent appointment in Paris next morning. The start was to be at 7.30 a.m. and I was advised that the regulations demanded (a) a valid passport, and (b) a landing at Hounslow [London's first 'airport'] to clear Customs outwards—whatever that meant.

"A passport was not one of my possessions in those days and would have taken ages to obtain, so I crossed it off the list. . . . We left the ground at 7.30 a.m. with the intention of hopping into Hounslow to see if the Customs man really existed so far from the sea. . . . Then I thought 'Does the Customs fellow at Hounslow really want to see me? Of course not! And, anyway, he won't be up at that hour'—so I decided to call on the way back and do the outward and inward clearances at the same time."

Shaw flew for A.T. and T., and was also their manager, until, in December 1920, they had to close down through lack of Government support. He then joined Basil Foster, a member of the famed Warwickshire cricketing family and a leading actor, who had a few cars which he hired out to airlines to take passengers between Hounslow (and, later, Croydon) and central London, and who also sold petrol and oil to the airlines.

The latter side of the business brought Jerry into contact with the Shell company, and in 1921 he persuaded them to install at Croydon Airport a static pump with an underground reservoir. A little later he became the company's representative there, and in 1922 he formed and managed the Shell-Mex Aviation Department.

Jerry was Shell representative at most of the flying meetings held between 1922 and 1939. His likeable personality, combined with a fine line to sell, persuaded many pilots to use the company's spirit for races and world flights. When Shell-Mex merged with B.P. in 1931 Shaw's services were taken over by the Asiatic Petroleum Co., which was the parent firm of Shell-Mex, Ltd., and is now the Shell Petroleum Co., Ltd.

Jerry was primarily responsible for the world-wide organization of the aviation department of Shell and he travelled to all parts of the globe to get it going. He flew over the Cairo-Khartum route in 1930 preparatory to the opening of the Imperial Airways route, and two years later he surveyed the flying-boat route to Lake Victoria. Later he surveyed and laid down the fuel organization for the routes to the Far East and Australia and in 1937 surveyed Newfoundland and established refuelling bases there.

During the late war he was constantly engaged in examining Shell facilities on R.A.F. Transport Command routes all over the free world. When full airline operations were restarted after the war he laid down a Shell organization to serve the B.O.A.C. and S.A.A.F. landplane route through Africa and during the next year he prepared for the Solent flying-boats used on this route for a time. He also organized, by personal visits, the flying-boat refuelling bases to Australia, New Zealand, and the Far East and accompanied B.O.A.C.'s Constellation proving-flight to Singapore and Sydney in 1948.

More recently he has organized the kerosine refuelling-points for the Comet routes and he has just returned from a valedictory world tour to see that the fuelling-points for B.O.A.C. Comet and Britannia fleets will make the change-over smoothly.

Though he is now 60, Jerry Shaw looks, and in fact is, a young man still. He has told the writer that he does not mean to be turned out to grass and that he has plans for further business in aviation. What these plans are he is not yet prepared to say, but we can be sure that any new Jerry Shaw venture will be of benefit to British civil aviation.

G. D.

AIRCRAFT INTELLIGENCE

UNIFORMED: Of 103 Martin 4-O-4s in service or on order, 101 will fly in airline colours; Trans World Airlines have ordered 61, and Eastern Air Lines 40. The remaining two are for the U.S. Coast Guard, which will use them as multi-purpose transports. The first Coast Guard 4-O-4 is pictured here before delivery at Martin Airport, Baltimore.

Great Britain

Short S.B.3. This prototype (WF632), which made its first appearance at the Farnborough Show in 1950, has now been scrapped and broken up. Basically, the S.B.3 was a Sturgeon T.T. Mk 2 airframe powered by two Mamba turboprops; the aircraft was designed for anti-submarine work and featured a redesigned nose accommodating radar equipment and observers. Only one prototype was built. All the Sturgeon Mk 2 target-tugs, incidentally, have now been delivered and are in service with the Royal Navy.

Saunders-Roe Princess. The first prototype is awaiting a replacement of a Proteus or two before being readied for continuation of her flight trials. At Farnborough-time she was flying with one half of a coupled unit blanked off and, later, with only eight of the ten turboprops providing power. At her present light weight for early flight trials she would be able to take-off on any seven Proteus 2s and fly on five or even four.

South Africa

Unhappy Ending. Two of the remaining six DC-2s in airline service, ZS-DFW and ZS-DFX, both owned by the South African company Phoenix Air Lines, were recently involved in crashes—within two days of each other. On both occasions, it is reported, the accidents were the results of fuel shortage. Between 1934 and March this year, when they were ferried to South Africa, the two aircraft flew a total of some 14,000 hr in the service of Swissair; their previous registrations (respectively, HB-ITE and HB-ITO) had become familiar in many parts of Europe. Remaining DC-2s are widely dispersed: two operate in Finland, one in Guatemala and one in the U.S.A.

U.S.A.

Military Super Constellations. Illustrated in *Flight* of November 7th was the Lockheed R7V-1 Super Constellation, powered by Wright Turbo-Compound engines and built for the U.S. Navy. As an alternative layout to the 106 passengers, the R7V-1 will carry up to 19 tons of freight or 73 stretcher cases. A later development, the R7V-2, will have Pratt and Whitney T-34 turboprops.

An unknown quantity of special high-altitude radar early-warning "picket" Super Constellations (understood to be developments of the WV-2 type ordered by the U.S. Navy) will be supplied to the U.S.A.F. This order is associated by *Aviation Week* with the Lockheed announcement that there would be no commercial deliveries of Super Constellations in the last quarter of this year. The same journal considers that the U.S.A.F. early-warning aircraft—which, incidentally, were originally announced as military transports—are the outcome of the U.S.A.F. worries concerning its domestic radar screen.

North American YF-93A. Two specially modified versions of this Sabre variant are being used by the N.A.C.A. for comparative flight-trials at Moffett Field, California. Both are powered by Pratt and Whitney J-48 (Tay) turbojets rated at 6,250 lb thrust; the first has "scoop" air intakes beneath the cockpit resembling those of the Supermarine 510, and the second has flush fuselage intakes just forward of the wing leading-edge. The second YF-93A also differs in having an afterburner capable of increasing thrust by some 2,750 lb. *Aviation Week* reports that by different combinations of the nose and tail sections N.A.C.A. can, in effect, have the use of four different aircraft for use in their series of flight-trials to determine airflow-behaviour at high speeds.

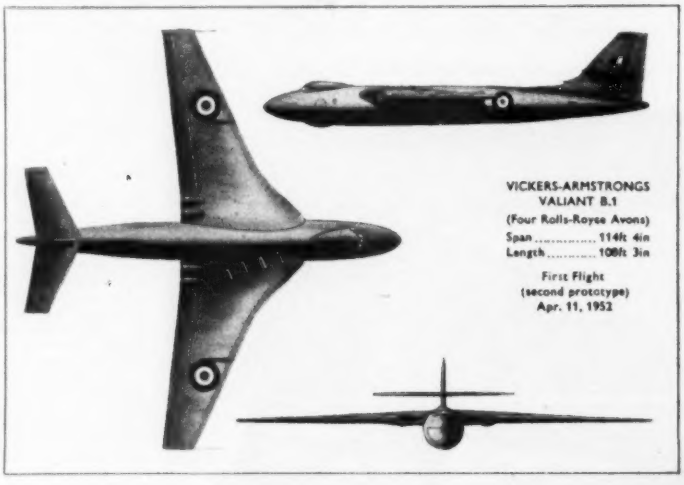
France

Atar-Meteor. On its first flight, this experimental machine was taken from Hamble (where the French power-units had been installed) to Boscombe Down by Mr. Peter Fowler, A.S.T. test pilot; it has now completed 3½ flying hours without more than the usual minor adjustments being called for. The installations of the Atars in Meteor RA491 are similar to those of the first Sapphires, although nacelle dimensions are thought to be slightly larger.

This particular Meteor airframe, now modified to Mk 8 standard as indicated last week, was the basis of the first Avon-Meteor. The all-up weight, with ventral tank, is 19,768 lb, and the Atars each give 6,000 lb static sea-level thrust. When the machine has been delivered by air to S.N.E.C.M.A. at Melun-Villaroche, French markings and numbers will be substituted for the R.A.F. roundels and registration.

Fouga 170R Magister. The first prototype of this light-weight jet trainer, which was destroyed on November 3rd, had in the course of 30 hr of flight trials performed the full range of aerobatics and exceeded a speed of 500 m.p.h. in a dive. The second prototype, now ready to fly, is identical to the first. The third, which is due to fly before the end of the year, will have a pressurized cabin, two 12.7 mm guns, provision for rockets or bombs, a gyroscopic bomb-sight and an Hispano Suiza undercarriage installed for trial purposes.

Erratum. The registration of the B.E.A. Dart-Dakota *Sir Henry Royce* is G-ALXN, and not G-ALXM, as stated in an article in the issue of November 7th.



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SUPERSONIC BANGS: ROUND 3

The Controversy Continues

ARISING from two articles (by A. H. Yates on October 3rd and C. H. E. Warren on October 17th) and various letters in our correspondence columns, this controversy has attracted very considerable interest and brought contributions from some noted theoreticians. In the issue of October 31st, B. A. Hunn (Hawker senior mathematician) and W/C. N. Young discussed the explanations put forward by Messrs. Yates and Warren. Below, Mr. Warren amplifies some of his original statements and sums up the principal theories so far advanced; then W/C. Young weighs in again and ends by suggesting that four of the explanations can probably be convincingly reconciled.

THE two letters in *Flight* of October 31st on the above subject, by Mr. B. A. Hunn and by W/C. (ret.) N. Young, call for a reply. I will try to be brief.

Regarding Mr. Hunn's ideas, to me they show that *steady* flight at a Mach number of unity will lead to a bang of increased intensity. This I do not dispute. But I understand that the bangs that have been heard up to now have been caused by aircraft *breaking through* the sonic barrier: as far as I know no aircraft has yet flown *steadily* at a Mach number of unity. And unless an aircraft flies steadily at a Mach number of unity Mr. Hunn cannot get more than two or three circles to pass through any point at a given time. I consider that the acceleration effects are particularly important.

Regarding Mr. Hunn's detailed criticisms of my ideas, my answers are :—

(1) Retardation is not excluded as a source of supersonic bangs. For brevity I did the analysis only for the case of acceleration, but doing it for the case of retardation shows that the magnitude of the bang depends upon $\sqrt{\frac{4a}{-V_{or}}}$

(2) As a corollary of my remarks above, I maintain that, whilst supersonic flight could lead to bangs as intense as those due to typical accelerated (or retarded) sonic flight, steady sonic flight could lead to a bang of increased intensity.

(3) I was, of course, referring to fully corrected Machmeter readings: I am well aware of the folly of deducing anything from uncorrected readings. And in this connection I am told, quite authoritatively, that triple bangs have been caused when aircraft have touched sonic speed but twice; I should like to know how Mr. Hunn would explain three bangs in this case.

(4) I cannot read into my explanation the fact that the region in which the bangs are heard is roughly circular. It was certainly not intended. From the dives that I saw at Farnborough, I would say that the region could be three or more times as long, in the direction of flight, as it is wide. I cannot see the region being as long as a hundred miles.

Regarding W/C. Young's letter, I was using "aerodynamic disturbances" to mean the displacements created by an aircraft (treated as a streamlined body) by virtue of its size and shape. I think that this is the commonly accepted meaning of "aerodynamic." There are also the "acoustic disturbances", i.e. those due to the fact that the aircraft has engines—which are a source of noise, and the main source, I imagine. Finally, there are the aerodynamic turbulent fluctuations, or sounds, caused by the passage of the aircraft through the air. Mr. Yates may well have meant his word "noise" to include all three disturbances, but I thought that he meant only the last two; my explanation of the bangs is that they are due to the first—to what I call "aerodynamic disturbances."

My approach involving an imaginary string of balloons was necessary to show how the bang depends upon the acceleration of the aircraft, which I consider important. But there may be less colourful ways of showing this.

Regarding my parameter τ, due to an oversight on my part its interpretation was omitted from my article: 2τ is, of course, the time that the aircraft takes to fly its own length—about 0.05 sec at a Mach number of unity.

The increase in frequency to which W/C. Young refers is, of course, the well-known Döppler effect. However, one does not get infinite frequencies as the speed approaches that of sound, because finite waves do not proceed without change of form—there is a tendency for them to "topple." This toppling depends upon the steepness of the wave form, and at high frequencies this steepness is increased. In air, toppling leads to shock-waves. I think that this is the enlargement for which W/C. Young is asking. My theory took no account of the change of form that my "transient pulse" waves would undergo. In practice, of course, the waves would topple and arrive as a shock wave. However, one can explain the magnitude and timing of the bangs without going to this refinement: such refinement is necessary only if one wants to describe the exact "character" of the bang.

I still feel that my explanation of the supersonic bangs is the correct one—that is, as regards magnitude and timing of the pressure disturbances. However, I am sure that we have by no means heard the last of this subject, so may I be permitted to summarize, for the convenience of future contributors, the main explanations that have appeared in your columns up to now. They are :—

(1) The bangs are due to the noise of the aircraft, either inherent, as engine noise, or created by the passage of the aircraft through the air (as in the characteristic "swish" of a glider). This is my interpretation of Mr. Yates's first explanation.

(2) The bangs are due to the shock waves associated with steady supersonic flight. This is my interpretation of Mr. Yates's second explanation. In this explanation he attributed the two bangs to the nose and tail shock-waves that travel on when the aircraft decelerates through the speed of sound. He stated that the acceleration through the speed of sound higher up did not lead to bangs, owing to attenuation.

(3) The bangs are an aerodynamic effect. To explain them satisfactorily the history of the motion must be allowed for, particularly the acceleration or retardation. This is my explanation.

(4) The bangs are due to flight at sonic speeds precisely, and that flight at supersonic speeds does not lead to bangs. This is Mr. Hunn's explanation.

Does anyone care to add explanation No. 5?

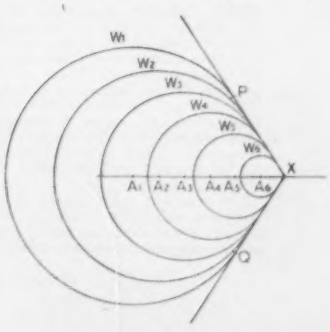
I am indebted to the Chief Scientist, Ministry of Supply, for permission to publish this reply, but the views expressed are my own.

R.A.E., Farnborough, Hants. C. H. E. WARREN.

THERE is one point in connection with the question of supersonic bangs that none of your correspondents has yet touched upon, and that is the *quality* of the sound heard. Mr. Warren took account of the loudness of the sound, and deduced that, if propagated in the normal way, it must have its origin in a release of energy far greater than can be accounted for by mere reinforcement of sound-waves. I have no fault to find with this conclusion so far as it goes; but it is susceptible of two alternative interpretations, and in my opinion Mr. Warren chose the wrong one. He concluded that the sound must be caused by a very energetic disturbance, but I suggest that it can be shown that the sound is due to a moderate disturbance which is *not* propagated in the normal way.

To my ears, the supersonic bang resembles the sound of a smallish gun or shell-burst at a distance of only a few hundred yards. I judge this from the quality of the sound as well as its loudness, and this is not a mere academic judgment; the sound does seem to emanate from a point in space very much closer to me than the aeroplane. Mr. Warren has demonstrated a possible explanation of the aeroplane's stentorian powers, but I am much more interested in it in its capacity of ventriloquist. A disturbance as powerful as that envisaged by Mr. Warren, at a distance of anything up to ten miles from the observer, would boom and rumble like a distant thunderstorm—how is it that we actually hear quite a sharp crack, which seems fairly close at hand? I suggest the following explanation.

In the accompanying drawing I have shown diagrammatically the configuration of the sound-waves emitted by an aeroplane flying at a steady speed of Mach 1.2. X is the present position of the aeroplane, and PX and QX are tangents to all the circles W1, W2, etc., which represent waves emitted when the aeroplane was at A1, A2, etc. The circles are incomplete, the shorter arcs between PX and QX being omitted—not for convenience, or through inadvertence, but because they are not there. As Mr. Hunn pointed out, pressure-waves emitted at speeds above the speed of sound do not behave in all respects like normal sound-waves. In particular, they travel faster, so that the circles are stretched forwards in the direction of travel of the aeroplane, and in the zone



SUPERSONIC BANGS: ROUND 3...

between the two tangents (that is to say, at any angle to the aeroplane's track in which the resolved component of its forward speed exceeds Mach 1) the circumferences of the circles—i.e., the actual wave-fronts—are so distorted as to coincide with the tangents themselves. Hence, while the sound-waves emitted by the aeroplane expand normally in nearly all directions, though with varying frequency, within the zone bounded by the angle already defined the frequency rises to infinity and all the waves coalesce into one; its energy is approximately equal to the sum of the separate energies of all the individual waves. (With all respect to Mr. Hunn, there cannot be an *infinite number* of waves, as only a finite number is emitted every second, and the pressure could not rise to infinity either in theory or in practice.) What this reinforcement would actually amount to, I have no idea—I am *not* an expert of any kind—but for the sake of argument I propose to assume that the combined wave at PX and QX has 500 times the energy of the average single wave.

In the conditions shown in the drawing the lines PX and QX are straight. If the aeroplane were accelerated—either by a change of speed or by a change of direction—these lines would become curved. They will, in fact, only be straight (a) when the aeroplane flies in a straight line at uniform speed, or (b) when the effect of a change of direction exactly offsets the effect of a change of speed. Case (a) will arise when an aeroplane reaches a steady supersonic speed in a dive, case (b) when it simultaneously reduces speed and flattens its dive-path, and also perhaps when it reaches Mach 1 while the dive is still growing steeper.

The drawing shows only a two-dimensional section of a phenomenon occurring in three dimensions. The wave-fronts which I have depicted as circles are actually the surfaces of spheres; and the wave-fronts lying along PX and QX when these are straight lie on the surface of a cone. Now, any wave which expands in the form of a sphere will be governed by the law of inverse squares: the intensity of its effect at any point will be inversely proportional to the square of the distance of the point from the source of the wave. But for a wave which expands in the form of a cone, or any other surface having only single curvature, the inverse-square law does not hold good: *the intensity of its effect at any point is proportional inversely to the distance, and not to its square*. Our ears, on receiving a sound propagated in this abnormal manner, will assume from force of habit that it has followed the inverse-square law and will judge that it has originated from a point much closer than its actual source.

Let us take a numerical example. An observer A is 100ft away from an aeroplane, and another observer B is ten miles away—say, 50,000ft. For normal sounds, then, the intensities they receive will be in the ratio of $100^2 : 50{,}000^2$, or 1 : 250,000. For sounds propagated in this abnormal way, the ratio will be 100 : 50,000, or 1 : 500. (In this case, observer B, hearing a sound 500 times louder than before, will judge that it must come from a point $\sqrt{500}$ times closer—that is, from roughly 1/22 of its true distance.) If the abnormally propagated wave has 500 times the energy of the normal one, then the sound heard by B at a distance of ten miles will be just as loud as the sound heard by A when normally propagated at a distance of 100ft.

What I like about this theory of mine is this. Starting from a clue which neither Mr. Yates, Mr. Warren nor Mr. Hunn took into consideration, I have agreed with Mr. Hunn as to the method of following it up, I have agreed with Mr. Yates as to the true cause of the bangs (assuming that "accumulated sounds" and "shock-waves" may be regarded as different aspects of the same thing), and I have agreed with Mr. Warren as to the circumstances in which the bang will be heard. This suggests strongly that, with a little adjustment all four explanations can be condensed into one explanation, and that the true one.

N. YOUNG,
Wing Commander (Ret.).

Horning, Norfolk.

N.Z. RACE ENTRY

NEWS—though mostly of proposals rather than of firm decisions—continues to trickle in concerning entries for the 1953 England to New Zealand Air Race.

One apparently definite entry lately notified is a Hastings of No. 41 Squadron, R.N.Z.A.F. It is to be flown by S/L. Watson, commanding officer of the squadron, and it is reported that some passengers may be carried in addition to the crew of fifteen.

From Australia comes a report that F/L. J. L. Whiteman, R.A.A.F., may, with private backing, enter a Mustang (Rolls-Royce Griffon).

ADASTRAL PRODUCTION

ONCE again, as has come to be expected of them, the Adastral Players (Air Ministry and Ministry of Civil Aviation) presented a first-class production at the Scala Theatre on November 10th and 11th. This time their choice was *Dear Octopus*, by Dodie Smith, a comedy in three acts which may have been known to most of their audience, but which, nevertheless, is a pleasant and, at times, heart-warming play.

Joan Collier was outstanding in the "meaty" part of Dora Randolph, who is happy to have her children and grandchildren at home at her golden wedding celebration; also making the most of a satisfying part was Michael Cary, who was authoritative and had an attractive speaking voice.

The rest of the cast, ably coached by the producer, Arthur Beckess, were entirely competent, and the distinguished audience, which included Mr. A. T. Lennox-Boyd, Minister of Transport and Civil Aviation, and Air Chief Marshal Sir Frederick Bowhill, showed its appreciation by sustained applause at the final curtain.

U.K.-CANADA TRADE DIRECTORY

THE Canadian Association of British Manufacturers and Agencies (CABMA), which was formed with the support of the Dollar Export Council, Dollar Sterling Trade Council, Association of British Chambers of Commerce, Federation of British Industries, and the National Union of Manufacturers, has, as its sole purpose, the development of British trade with Canada.

By arrangement with CABMA, Iliffe and Sons, Ltd., and Kelly's Directories, Ltd., are jointly publishing in June 1953—and thereafter annually—the first officially sponsored directory of British manufacturers and exporters whose products and services are available in the Canadian market.

The *CABMA Register*—the volume's official title—will have six sections, its many thousands of carefully classified entries providing exhaustive references to the names, addresses, proprietary names and trade marks, products and services of British manufacturers and exporters actively engaged in trade with Canada (including Newfoundland). No charge will be made for standard entries; and a glossary in French-English will add to the utility of the register.

The advertisement section is open to all British manufacturers and exporters whose products are sold in Canada through associate companies and agencies, or direct to buyers, and to Canadian organizations concerned with the furtherance of Canadian-U.K. trade. A system of cross-references will ensure that the user's attention is drawn to the appropriate advertisement whatever section is consulted. Details are obtainable from Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

Mr. F. G. Montfort Bebb, Iliffe assistant managing director, is now in Canada to discuss final plans for launching this major contribution towards Canadian-U.K. trade.

FORTHCOMING EVENTS

Nov. 21. Institute of Navigation: "The Vertical Reference in Navigation," by W. A. W. Fox and D. Barnett.
Nov. 25. Society of Instrument Technology: Symposium on "Control Valves." Papers by A. R. Aikman, B.Sc., H. R. Walton, B.Sc., A.M.I.Mech.E., and B. W. Balls, B.Sc., A.M.I.Chem.E.
Nov. 25. Plymouth Aircraft Recognition Society: Film Show.
Nov. 27. R.Ae.S.: "Photo-elasticity and Aircraft Research," by Col. H. T. Jessop, T.D., M.Sc., F.Inst.P.
Nov. 29. S.L.A.E.: "The Bristol Proteus Gas Turbine," by D. Dekkers.
Dec. 2. R.Ae.S. Graduates' and Students' Section: "Aerodynamics of Wind Tunnel Design," by J. C. Gibbings, Ph.D., B.Sc.(Eng.), Grad.R.Ae.S.
Dec. 3. Royal United Service Institution: "The Air Battle," by Air Chief Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.
Dec. 4. R.Ae.S. Section Lecture: "Air Traffic Control Today and Tomorrow," by Capt. V. A. M. Hunt, A.F.R.Ae.S.
Dec. 5. Helicopter Association: "Simulation of Flight Loads by Ground Tests," by M. J. Brennan, B.Sc., and R. Hafner.
Dec. 5. Herts and Essex Aero Club: Annual Dinner and Dance.
Dec. 6. Northern Heights Model Flying Club: Annual Dinner and Dance.
Dec. 13. British Interplanetary Society: "Guidance and Control of Missiles," by J. Humphries, B.Sc. (Eng.), A.M.I.Mech.E., A.F.R.Ae.S.
Dec. 13. British Interplanetary Society, Birmingham Branch: "Fundamentals of Nuclear Energy Generation," by Dr. D. C. Leslie, M.A.
Dec. 16. R.Ae.S. Graduates' and Students' Section: "An Introduction to Aircraft Vibration," by D. J. Mead, D.C.Ae. Grad. R.Ae.S.
Dec. 16. R.Ae.C.: Film Show, Londonderry House.
Dec. 17. Institute of the Aeronautical Sciences, New York: Sixteenth Wright Brothers Lecture.
Dec. 17. Aircraft Recognition Society: Brains Trust.
Dec. 18. R.Ae.S.: Full-day Discussion on "Fatigue."
Dec.19-20. Institution of Production Engineers: Conference on Problems of Aircraft Production.
Dec. 20. British Interplanetary Society, Manchester Branch: "Rocket-motor Testing," by D. Hurdon, B.A.
Dec. 30. Plymouth Aircraft Recognition Society: Meeting.
Jan. 17. Aircraft Recognition Society: Sixth All-England Recognition Contest.
Feb. 9. Institute of Transport: Brancker Memorial Lecture: "The Influence of Military Aviation on Civil Air Transport," by Sir Frederick Handley Page, C.B.E.

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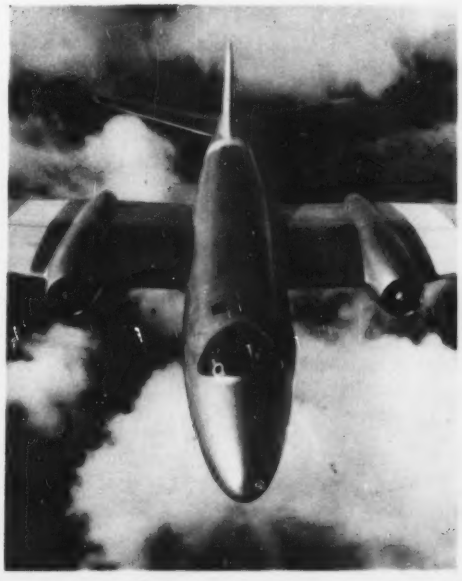
Immaculate in its Flying Training Command uniform of silver and yellow, the Canberra T.4 is pictured (above) against a superb cloud-background. The close-up below gives an intimate impression of the side-by-side seating arrangement for pupil and instructor. Behind them, in the fuselage, is stationed a third crew-member—the navigator.

CANBERRA TRAINER

THE exceptionally fine qualities of the English Electric Canberra—at both ends of the speed scale—have been clearly demonstrated in recent months. For sheer speed, the record-breaking two-way flight across the Atlantic by W/C. Roland Beamont, F/L. Hillwood and S/L. Watson in the Canberra B.5 deservedly won the highest praise for aircraft and crew. By contrast, few who were at Farnborough a few weeks afterwards will have forgotten the masterly demonstrations of the low-speed manœuvrability of the T.4 trainer version. The known high-speed capabilities of the type made the tight S-turns and other manœuvres at just above stalling speed the more remarkable on this occasion.

The main changes found in the trainer version are the provision of side-by-side dual control and a slight decrease in the all-up weight. On this page are shown the latest air-to-air photographs of the T.4, taken during a test flight before delivery of this particular machine to the R.A.F. The machine was being flown by F/L. Peter Hillwood from the pupil's seat on the port side, accompanied by a member of the English Electric flight liaison staff.

In R.A.F. service, it is likely that the T.4 will initially prove of most value to Operational Conversion Units of Bomber Command, rather than with Training Command. After two weeks' ground training at the O.C.U., dual refresher flying and type conversion (now performed on Meteor T.7s and Canberra B.2s respectively) will be carried out on the Canberra trainer. The side-by-side seating arrangement of the T.4 will be especially appreciated during this period. Conversion onto the type will be followed by day and night operational training of complete crews on Canberra B.2s. It is thus emphasized that the rôle of the T.4 is pilot-familiarization and not combined crew training.



Torkil Viking, one of 14 Douglas DC-6Bs being commissioned by S.A.S. Two of these aircraft are being delivered this month over the Polar route.

THREE-NATION AIRLINE

THE Scandinavian Airlines System, in its present form, came into being in 1951. It comprises D.D.L. (Danish), D.N.L. (Norwegian) and A.B.A. (Swedish Airlines), the three components working together as one organization.

S.A.S. operates Danish-, Norwegian- and Swedish-registered aircraft, but it is not unusual for a passenger to fly on, say, a Swedish domestic route with a Swedish crew but in a Norwegian-registered aircraft.

The work of S.A.S. is extremely varied, ranging from the operation of the "Royal Viking" DC-6B flights between Scandinavia and the U.S.A. and the DC-6 services to South America, East Africa and Japan, to such extremes as the Norwegian coastal route which reaches far into the Arctic on the Norwegian-Soviet frontier and which can only be operated during the summer months.

Until last year, the Norwegian coastal route was operated with Short Sandringhams as far north as Tromsö, with Ju 52 3m floatplanes on the northern sector. With the reintroduction of the service this year Saab Scandias took over the route as far as Bodö, north of the Arctic Circle, and the Junkers came south to make connection.

Copenhagen Airport at Kastrup. The three main hangars and workshops in the foreground are built mainly on reclaimed land. The passenger buildings are in the middle distance.

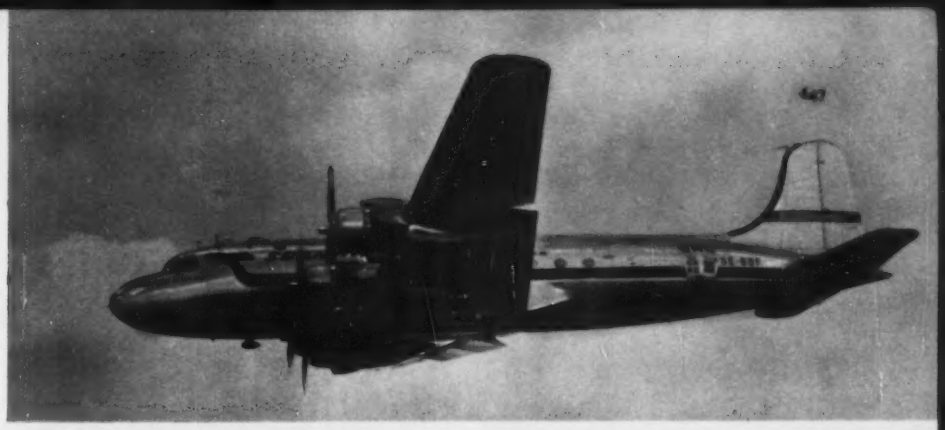
The Scandias also took over the operation of another Northern route when, on October 27th this year, they began working the Stockholm-Luleå service. Luleå is about 60 miles south of the Circle, but it was already under snow when the writer flew-in on one of the first Scandia services. Timekeeping under difficult conditions was perfect. Passengers board and disembark in the hangar during the winter and, on departure, the full run-up and pre-flight check are made in the hangar.

S.A.S. has, not unnaturally, a deep interest in the north, and a Polar route is planned for operation in 1953. This route will link Scandinavia, the U.S.A. and the Far East by way of Thule in Greenland. Two of the airline's new DC-6Bs are being delivered over this route this month on their way from California to Copenhagen. Further S.A.S. interest in the north is likely to lead to some helicopter experiments with a Westland-Sikorsky S-55 in North Norway.

The smartly painted and attractively furnished S.A.S. fleet is maintained at the airline's three main bases at Kastrup, Copenhagen; Fornebu, Oslo; and Bromma, Stockholm. Of these bases, Kastrup is perhaps the most interesting as the three great hangars have been built mostly on land reclaimed from the sea specially for this purpose. With their fluorescent lighting, and the name "Scandinavian Airlines System" in red neon, they are an impressive sight when seen on a night approach by air.

S.A.S. is a good example of three nations working together in order to give first-class public service in the most efficient and friendly manner. Although English is the official language of S.A.S., we were told recently that conversation at the Stockholm H.Q. is frequently conducted in "Sasperanto" —a blend of the three Scandinavian tongues. By suppressing national differences in the interests of a common purpose, employees of this unique airline have achieved well-merited success.

J.S.



Sverker Viking, one of the S.A.S. DC-4s. This one was originally operated by A.B. Aerotransport under the name Vastan.

Skjold Viking, one of the S.A.S. fleet of twelve Douglas DC-6s, taking-off from Kastrup. This DC-6 is seen in the new S.A.S. white-top colour scheme with the deep blue Viking longboat motif.

(Below) Jutulen, one of the two S.A.S. Sandringham flying-boats now awaiting disposal. These aircraft were used on the Norwegian coastal route to Tromsö. In summer Scandias now operate as far as Bodö and Ju 52/3ms on floats maintain the northern sector to to Kirkenes.

(Above, right) The cantilever hangar at Kastrup, the Copenhagen Airport, forms the background to the S.A.S. Douglas DC-3 Eric Viking.

(Right) Fornebu Airport, Oslo, with the control tower and passenger restaurant on the right, the S.A.S. Saab Scandia Gardar Viking on the left and the famous ski jump of Holmenkollen in the distance.

The Lockheed F-94 two-seat fighter is powered by an Allison J-33 turbojet fitted with a Solar afterburner. The trio seen on the left are F-94As, two of which have "lit-up" their thrust-boosting device.

A newer variant is the F-94B, three of which are seen (right). Assigned to the 314th Air Division for the defence of Japan, they belong to the 35th Fighter Interceptor Wing. The afterburner results in a bulky rear fuselage.

AFTERBURNING

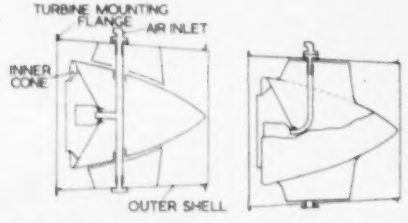
A Review of Current American Practice

AMONG the most informative papers presented at the National Aeronautic Meeting of the Society of Automotive Engineers in California last month was one entitled *Afterburners and Variable Nozzles*, prepared by Ralph Kress, design engineer of the Solar Aircraft Company, of San Diego.

Although, said the lecturer, much had been written about afterburner theory, there was little published information regarding detailed design of such devices; his paper intended to alter this position. An afterburner was essentially a second complete engine attached to the exhaust of a turbojet to provide additional thrust boost. In particular, it accomplished this by increasing the gas temperature behind the turbine by burning additional fuel in a specially designed tailpipe. But it was much more complex than a simple tailpipe, since it had to perform its function without affecting the operation of the main turbojet.

An afterburner presented special design problems. For practical purposes, the tailpipe gas temperature exceeded 3,000 deg F, considerably hotter than the melting point of most alloys. Considerations of reliability and serviceability posed severe problems when allied with such temperature demands; in particular, the variable nozzle had to be capable of adjusting the jet area efficiently without leakage and distortion. Other problems were the cooling of the hottest areas and the maintenance of efficient combustion of large quantities of fuel in the high-speed gas flow.

Early work by the Solar Aircraft Co. had been concerned with obtaining stable performance and combustion; in this regard, interest centred upon the fuel burner design and, because of this, the early units were made very simply to alleviate the high-temperature problems met with near-stoichiometric burning. Much testing and flight experience was accumulated, and it soon became evident that major improvements were desirable to better installed performance. Requirements indicated that a smooth variation of nozzle area was necessary, so eliminating the surge given by early two-position afterburners. Mr. Kress then considered the design of each major afterburner component.



Figs. 1 and 2. Floating (left) and integral (right) tailcones.

Diffusers.—The gases left a turbojet through the shortest possible tailpipe. They usually left the turbine at near-sonic velocities at which stable combustion was impossible. In the afterburner, a diffuser section reduced the velocity to between 400 and 500 ft/sec at the combustion section. Fig. 1 showed a typical tailcone, in which the inner cone was mounted on cross bars tied into the outer shell; the cone was not rigidly connected to the cross bars, so permitting differential expansion. An integral tailcone (Fig. 2) solved many difficulties met in earlier designs. Here, the cone struts were structural members of the cone instead of fairings, the cross bars being eliminated. The inner cone was usually retained by pins inserted from the outside of the assembly, with proper allowance for thermal expansion.

The method of attachment of the inner cone to the outer shell had always been a problem; although the low pressure-differential within the assembly indicated that gas loadings would not be such as to demand particularly strong attachments, experience had produced a long history of shell and cone fractures. Investigation had shown that these fractures had probably been caused by movement of the heavy inner cone, acted on by vibration and pressure variation. Conditions were much more severe during afterburning, and failures had been known after brief periods. A cone attachment had now been designed which isolated the inner cone from the outer shell by means of temperature-resistant resilient pads.

Most modern turbojets had provision for turbine disc cooling on the discharge side. This was usually accomplished by tapping compressor air through an external pipe which re-entered the engine through the tailcone support structure (Fig. 2).

Tailcones were welded assemblies, usually made of stabilized, corrosion-resistant steel. In some cases, however, the afterburner dictated the longitudinal stress in the outer shell, particularly in cantilevered installations; in such cases, this stress, factored for g loading, demanded materials with higher strength, such as Inconel W, and N-155 (American designations). The inner cone was usually of corrosion-resistant steel, except when burner design entered into the tailcone configuration.

Burners.—The burner section usually consisted of the fuel injection system and the flame holder, and with it was often incorporated either the diffuser or nozzle section for simplicity, but a separate burner section could readily be replaced.

Generally, the fuel injection system consisted of a number of spray bars with perforated fuel injection points in the gas stream, so positioned as to produce a particular fuel pattern throughout the tailpipe. External fuel manifolding (Fig. 3) left the gas flow area clear, but involved the possibility of fuel leakage at joints, and a consequent fire hazard. The internally manifolded system (Fig. 4) had the disadvantages of severe differential expansion and

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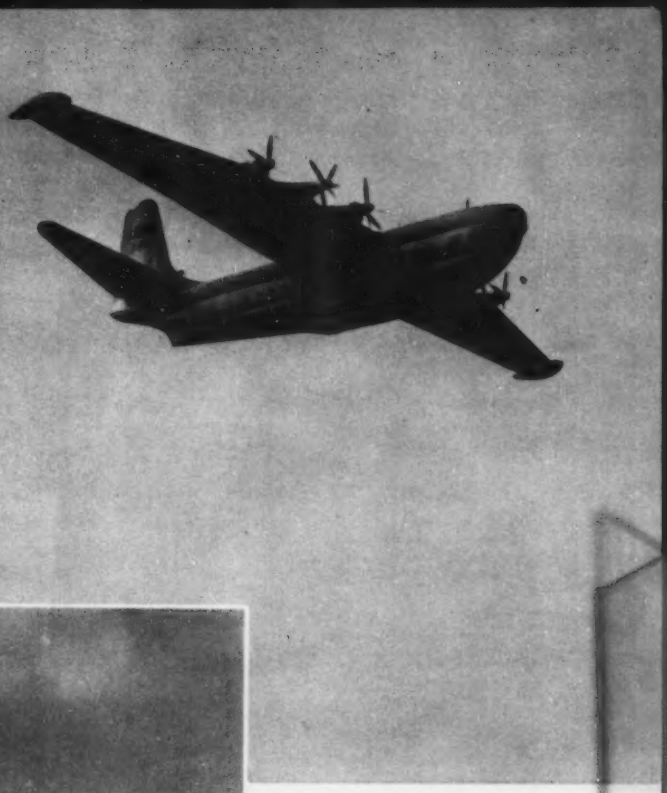

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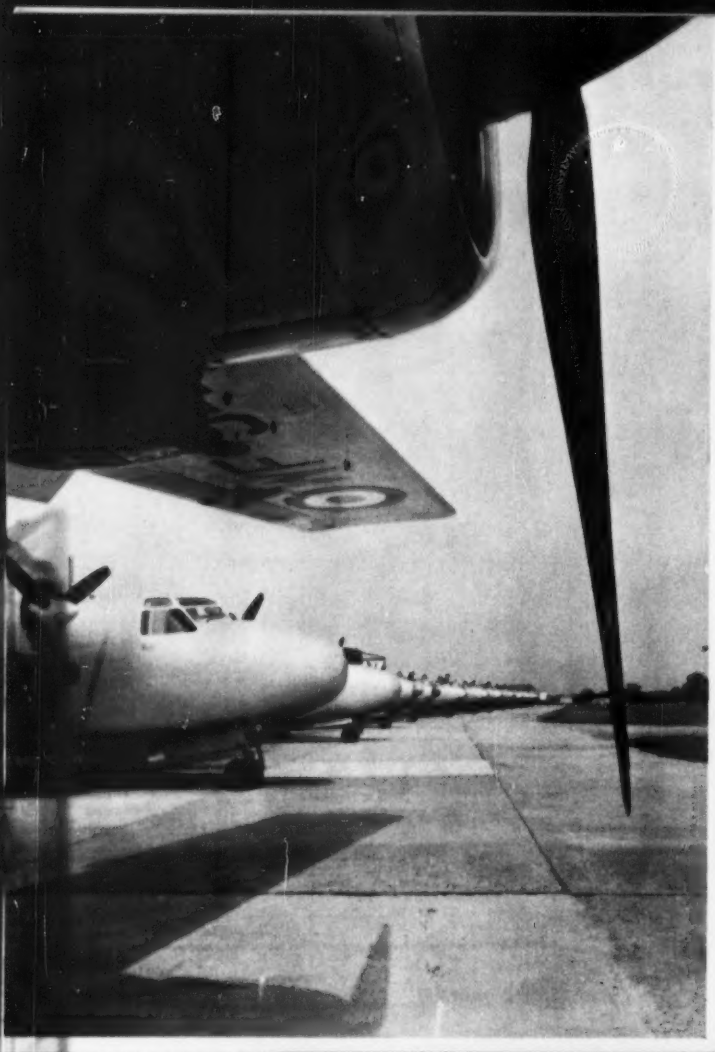

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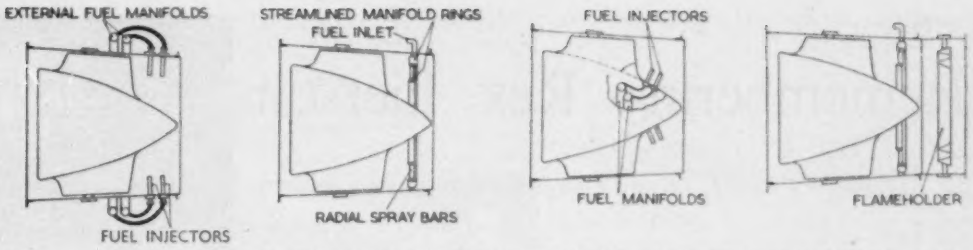


Figs. 3 to 6. Various methods of manifolding (external, internal, and within the tailcone) and a typical flameholder.

AFTERBURNING . . .

the impeding of the gas flow, but gained by having fewer joints—and those were welded—from which leaking fuel merely burnt in the gas stream. Designs had been made incorporating fuel injectors in the tailcone, thereby reducing overall afterburner length (Fig. 5). Fuel leakage was here avoided by accomplishing manifolding within the tailcone.

If leakage did occur in such a manifold, it would not be dangerous to the engine compartment, but raw fuel could burn within the tailcone causing structural deformation therein. Fuel injector size was selected to minimize boiling and coking while not producing excessive pressure drop. Injector cross-section was usually circular, but resulting turbulence could attach the flame to the injector, causing eventual failure of the injector and, possibly, other parts of the afterburner.

Aerodynamically streamlined injectors almost entirely eliminated this problem; aspect ratios leading to low-drag sections were practicable, but the section had to be designed to withstand the internal fuel pressure of perhaps 600 lb/sq in.

Flameholders.—This component accepted the combustible mixture from the injector and, by providing a space conducive to flame propagation, maintained a uniform flame-front across the tailpipe. It followed that the flameholder produced turbulence resulting in pressure losses; extreme care was therefore necessary in its design to prevent serious thrust loss under all operating conditions. The flameholder was mounted downstream of the injector at a distance suitable for fuel dispersion. It was usually attached to the outer shell *via* streamlined struts which permitted differential expansion. If flow breakdown occurred around these struts, the resulting turbulence could produce hot spots on the tailpipe skin. To alleviate such hot streaking, flameholders had been mounted on internally manifolded injectors, and also attached to the inner cone; in either case, the subject parts had to carry the heavy loads induced by the violent combustion forces acting on the flameholder. Flameholders were usually fabricated, heavy-gauge sections in N-155 or other high-temperature alloys. Cast sections, however, had also been employed.

Nozzles.—The nozzle was designed to convert the available pressure energy in the tailpipe to kinetic energy, and the diameter had to give good efficiency over a wide range of flight conditions. In an afterburning turbojet, the diametral span required of the nozzle was so great that variable diameter became necessary. Early afterburner nozzles were of a two-position type—fully on or fully off—and only one area was available for afterburning use. In an early two-position clamshell-type nozzle assembly two stainless steel "clamshells" were arranged to restrict the flow when closed, swinging clear of the gas stream for afterburning.

Adapted to fully-variable operation (Fig. 7), the clamshell pattern suffered from excessive actuating friction and imperfect sealing, resulting in poor, and deteriorating, performance. After analysis of this design investigation centred on the fully-variable "flap-type" nozzle. This design appeared relatively free from distortion and heat trouble, and was readily adaptable to mass production. The type was quite sound aerodynamically and showed excellent orifice coefficients in comparison with circular nozzles. Initially, a four-flap nozzle was designed (Fig. 8), which required no seals. The flaps varied the orifice from circular section when open to an approximate square shape when closed; operating loads were not excessive, although higher than had previously been encountered. When closed, the flaps projected into the gas stream at right angles; the gas-stream end of the flap was rounded to reduce orifice losses.

The unit was made of corrosion-resistant steel, except for the flaps themselves, which were of N-155 spot-welded. When tested, the design gave good results. Its major disadvantage was the large clearance required around the jet orifice, which increased aircraft drag. It was felt that efforts should be made towards making nozzles more dimensionally efficient. Nozzles employing internal bulbs sliding longitudinally were attracting much attention. Bulb-type nozzles had been successfully used in plain turbojets but, when used in the jet from an afterburner, the actuation and induced bulb loading presented a difficult problem.

Further study led to numerous individual flaps to give a more circular orifice in all positions. Very many such configurations were being analysed. Many of these had been manufactured and tested, and it was unfortunate that security prevented their discussion.

Actuators.—Early two-position afterburners required simple actuators; the nozzle was aerodynamically balanced, so actuator force was largely spent in setting the eyelids properly, for which purpose tapped compressor air was usually sufficient. The advent of the variable thrust afterburner required an infinitely variable actuator capable of locking at any desired point. Again, the flap nozzles were aerodynamically unbalanced, so demanding greater actuator power. Forms of actuator which could be employed were electrical, hydraulic, lubricating oil, or pneumatic.

An electric actuator was a natural choice for an afterburner, for a variety of reasons. But it had to be placed in a high-temperature zone near the nozzle, and therefore demanded complicated cooling. The power requirements of flap-type nozzles—upwards of 3 h.p.—implied a very heavy actuator, so that, in practice, electric actuation was limited to balanced clamshell nozzles. All turbojets carried hydraulic pumps and high-pressure oil systems which could provide large forces in lightweight actuators. But particular care was necessary in preventing all leakage near the hot afterburner, and the high ambient temperature of the turbojet could affect the operation of hydraulic control valves. The hydraulic fluid itself could boil or decompose in such installations, although this problem was removed by newer fluids. In Mr. Kress's opinion, tapped compressor air was attractive for many reasons: a supply was available whenever the engine was running; dumped exhaust air was harmless; no return pipes or reservoirs were necessary; high temperature introduced few problems; packings and seals need not be perfect; and the compressed air could not only transmit, but also store, energy.

Against this, the available pressures were low in comprison with hydraulics, and were a function of altitude and air speed. Another disadvantage was the compressibility of the air, which impaired accurate piston positioning. A new Solar development was a stabilized air cylinder incorporating an integral hydraulic system. Of the servo type, the actuator operated at ambient temperatures around 400 deg F, the pneumatic section being of stainless steel and aluminium with special unlubricated piston rings.

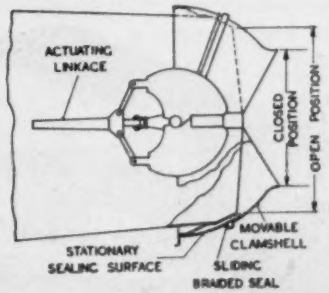
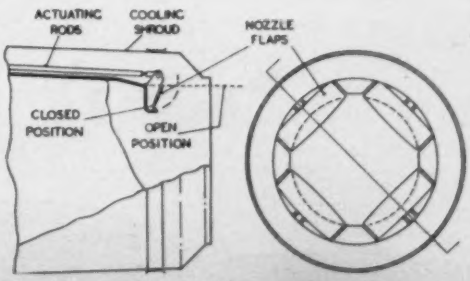


Fig. 7 (left). Fully variable clamshell nozzle.

Fig. 8 (right). Typical four-flap variable nozzle.



Remembering Rex Pierson

Sir Roy Fedden's R.Ae.S. Lecture Pays Tribute to a Great Designer

The late Reginald Kirshaw Pierson, chief engineer of the Vickers-Armstrongs Aviation Group.

A LARGE and distinguished audience assembled in the staff mess at Vickers-Armstrongs Weybridge Works on Wednesday, November 12th, for the reading of the first R. K. Pierson Memorial Lecture. The Weybridge Branch of the Royal Aeronautical Society was responsible for the organization of this "main" lecture, which in future years will be a branch fixture. Mr. George Edwards (Vickers Aviation chief designer) introduced Mr. George Dowty, president of the Society, who congratulated the Weybridge Branch on their foresight in organizing the first "named" lecture for a great aeronautical engineer. Mr. Dowty then introduced Sir Roy Fedden, the author of the lecture, who had been a close friend and business associate of Rex Pierson.

Sir Roy prefaced his lecture—entitled *Rex Pierson—an Appreciation, and the Lessons of his Work*—with a résumé of Pierson's early career, and a note on the distinctions he gained later. Reginald Kirshaw Pierson was born in February, 1891, at Fransham, Norfolk, where his father was rector. He was educated at Felstead School, and on leaving was destined to enter the Bank of England, but at the last moment was allowed to follow his natural bent and take up engineering. At the age of 17 he entered the Erith Works of Vickers, Ltd., as an engineering pupil-apprentice, and while passing through the various departments took his B.Sc. engineering degree—the hard way, at evening classes. When he was out of his time he took a job with the Vickers company in their newly formed aircraft division, as a technician under A. R. Lowe.

Rex Pierson learned to fly at Brooklands in 1913, and held Aero Club Certificate No. 660. He was elected a Fellow of the R.Ae.S. in 1926, and received the Society's Taylor Gold Medal in 1928 for a valuable paper on performance prediction. He served on the Council for several years and was a vice-president in 1945. He was a member of the Society's Advisory Committee to the Minister of Aircraft Production. For his services to the country he was made an M.B.E. in 1919, O.B.E. in 1941, and C.B.E. in 1943.

Sir Roy Fedden said that it was unusual for a man to reach such eminence while remaining in the service of one company throughout his whole working career. R. K. Pierson served the Vickers company for just over 40 years with outstanding success and unstinting loyalty. He played a profound part in the building up of the Vickers aircraft organization; in fact, for many years he *was*, technically, Vickers Aviation. Referring back to the initial stages of his career, in 1914 he became chief technician of the Aircraft Division of Vickers, and amongst other jobs was on the design and development of the Vickers Gun-bus. In 1917, at the early age of 26, he became chief designer of the Vickers Aircraft Division, chiefly at the instigation of Capt. Peter Ackland, and was put in complete charge of the design office at Basil Street, Knightsbridge, building up a considerable war-time staff there.

Immediately after the war, early in 1919, the London drawing offices were shut down and, selecting a small nucleus of the most promising staff at Knightsbridge, Rex Pierson moved them to the Vickers Aircraft Works at Brooklands Track, and from then onwards Weybridge was his headquarters. He remained chief designer until 1945, and his staff grew from two dozen to over 500 at the end of the last war, when he handed over to the present chief designer, Mr. George Edwards, and became chief engineer of the whole Vickers-Armstrongs Aviation Group.

The lecturer then referred to the list of 36 basic Vickers aircraft designs with over 140 variants which Rex Pierson inspired, and he selected a few for illustration and brief description. The first design for which Pierson was entirely responsible was the Vimy bomber with two Rolls-Royce Eagle engines. It was designed in 1917 immediately after he became chief designer, and was produced from scratch to first flight in under six months. It was ordered in quantity and proved to be a first-class machine. It earned undying fame by making the first non-stop crossing of the North Atlantic in the hands of Alcock and Brown. In the same year a Vimy made the first flight from England to Australia, and in 1920 another Vimy achieved a similar success to South Africa. Sir Roy then went on to refer to the first Vickers Viking, an amphibian with Napier pusher engine, a successful machine which won the Air Ministry £10,000 competition in 1920. A licence to manufacture this aircraft in Canada marked the birth of the Canadian Vickers company.

There followed, said Sir Roy, the Victoria, Virginia and Valentia series, which were a very successful family used in a number of rôles. Examples were still in commission with the R.A.F. up to the commencement of the last war.

In the twenties, the Vickers Company took a licence for the French Wibault, a high-wing all-metal monoplane, and this machine was Vickers' first serious entry into all-metal construction. In 1924 Harris Booth joined R.K.P. to assist in producing the first Vickers all-metal aircraft, the Viastra. Sir Roy referred to several special features of this machine, including the spats on the wheels, the all-moving tail unit, and the spars of wandering-web type—which, incidentally, consisted of two duralumin channels united by a light-alloy plate. A twin-float version of the Vellore was next illustrated by the lecturer, as an indication of the versatility of the aircraft designer of those days, and as a typical example of Vickers research into all-metal construction in the late nineteen-twenties. This new technique undoubtedly contributed in no small measure to the long life of the Victoria and Virginia family.

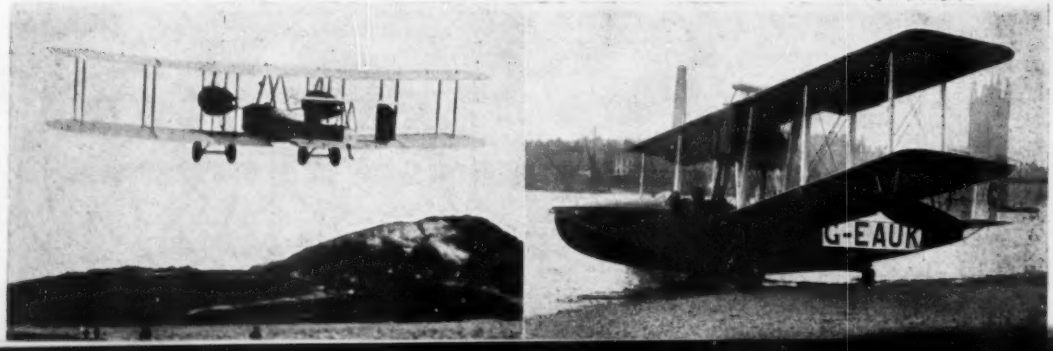
About 1926 R.K.P. designed the Vespa, continued Sir Roy. It was a high-aspect-ratio staggered metal biplane with Bristol Jupiter engine, and a number was sold to Ireland and Bolivia. One of the last production models was taken in 1931 and used for an altitude record (43,976ft) which was established in 1932 by Cyril Uwins.

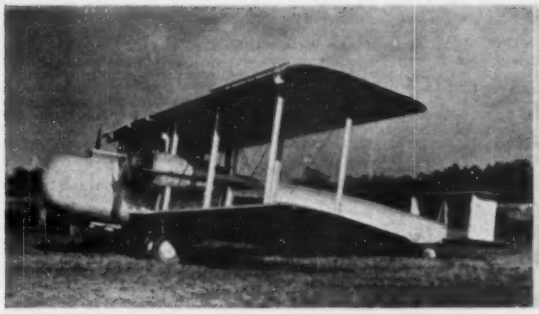
R.K.P. was not very enthusiastic over four-engined bombers, said Sir Roy, but in fairness to him it should be mentioned that in the late nineteen-twenties he produced the Vickers 163 heavy bomber with four Rolls-Royce engines and two tandem nacelles.

Another promising type of a very different kind was the Venom "Cow-gun" fighter with Bristol Aquila engine. This had, for the first time, a two-pitch de Havilland Hamilton airscrew, retractable

Left, the Vimy taking off on the first North Atlantic crossing in November, 1919. Right, the first Viking amphibian (Napier Lion), of 1920.

"Flight" photograph





"Flight" photographs

Left, Valentia (2 Bristol Pegasus), of 1934. Right, the Vespa (Bristol Pegasus S.3) which, in 1932, established the world's altitude record.

undercarriage, and long N.A.C.A.-type engine cowling. It is of particular interest at the present time as being an early and successful attempt to break away from the conventional fighter specification in favour of a lighter aircraft and smaller engine. Sir Roy thought it would be correct to say that this machine failed to go into production because the Bristol company were unable to manufacture the Aquila, due to pressure of other work.

The Vildebeeste was the next machine to be mentioned. There were various editions, and it was produced in hundreds and saw much service both at home and overseas. A new specification, G.4/31, for a general-purpose aircraft, was issued by the Air Ministry early in 1930. It was keenly contested and eight different prototypes were produced by various firms. Vickers won the competition with a biplane, but they pressed home to the Air Ministry the greater merits of the Wellesley, a mid-wing monoplane private venture built to the specification, and this was eventually selected for production.

It was in 1930 that Mr. B. N. Wallis joined the Weybridge design team as chief structural engineer, having previously been in charge of the design of the airship R.100 at the Airship Guarantee Company, a subsidiary of Vickers. As a result of his investigations into light airship-structures he produced the well-known geodetic principle which was first applied to the Wellesley. With Bristol Pegasus engine, the Wellesley was manufactured in considerable numbers and was successfully used by the R.A.F. right up to the early days of the last war. In 1938 Wellesleys took the world's non-stop long-distance record of 7,162 miles.

In the early nineteen-thirties the Air Ministry issued the B.9/32 bomber specification which, according to the lecturer, was the cause of a good deal of technical surmise as well as political discussion at the time, and it took a number of years before the type came to fruition. Fairly promptly, Vickers produced a prototype for the competition which was a low-wing monoplane using the Wallis geodetic construction. It was remarkably clean for a heavy bomber of those days, and gave an extremely good account of itself on test.

At about this time, said Sir Roy, R.K.P. paid his first visit to the United States and was duly impressed with the big strides made there in civil types. He also visited Mildenhall in October, 1934, for the start of the McRobertson Air Race to Australia. In company with other members of the aircraft industry, he was undoubtedly influenced by an event which has proved to be an important milestone in British aviation.

The Wellington eventually emerged in production form, with Frazer-Nash gun turrets, at the end of 1937, and undoubtedly did more than any other design to enhance Rex Pierson's reputation. There were six operational squadrons when war broke out. The Wellington had an excellent bomb load and range at the time at which it came out, and it preserved its youth right through the 1939-45 war. Over 11,000 of these "Wimpeys" were produced, and 5,000 were put back into service after repair. It eventually proved to be a good manufacturing job, and at one period, with the aid of the Chester and Blackpool shadow factories, over 300 Wellingtons a month were being produced by the Vickers group.

Towards the latter end of the war there followed the Warwick, a large edition of the Wellington but an entirely new aircraft with an all-up weight of 40,000 lb. It started life with two Rolls-Royce Vulture engines, changed to American engines for a time, and finally employed Bristol Centaurus. Eventually over 800 were produced for Coastal Command. Towards the end of the war the design team led by R.K.P. produced the Windsor, a high-wing monoplane heavy bomber with four Rolls-Royce Merlins and four separate landing-wheels under each nacelle, but this aircraft was discontinued with the cessation of hostilities.

R.K.P. inspired the aircraft design team to get off the mark quickly after the war with a civil type, and Vickers produced the Viking prototype in the summer of 1945.

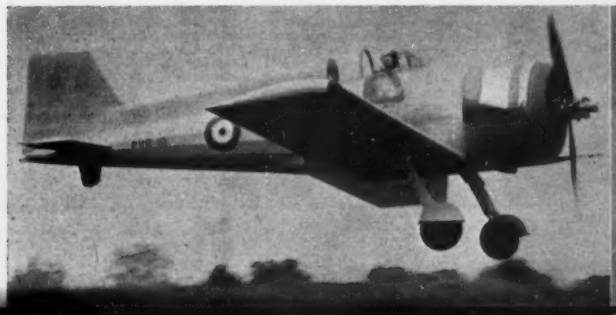
After concluding his remarks on aircraft Sir Roy Fedden turned to some personal reminiscences. "If Rex Pierson knew you and trusted you," he said, "he was a grand person to work with." Both he (the lecturer) and Rex Pierson had been keen on fly-fishing, and between the two wars had taken several holidays together on the Hampshire Test, and in Wales and Norway. Sir Roy said that they had had splendid times, and that he had had good opportunities of studying R.K.P.'s characteristics in an entirely different setting. He noted certain of the same qualities as in his work. For example, his patience, calm persistence at a job, unselfishness to his friends and general kindliness and good fellowship. Sir Roy was sure his staff would agree that one could usually get a decision out of R.K.P. If two alternative schemes were put up to him he would consider both carefully and, after a while would point to one and say, "That'll be all right, I think you'll find"; and it generally was.

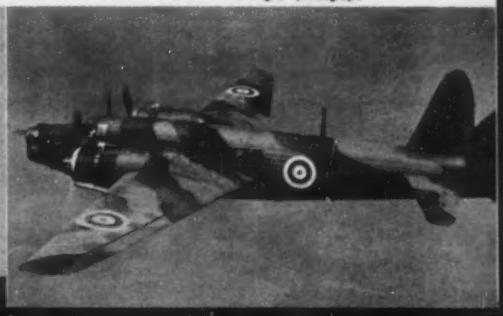
Sir Roy recalled that R.K.P. wore a gold ring which, when he was absorbed in discussion, he would spin on his finger or move up and down, and when very deep in thought he would take it off and spin it on the table like a top. He was a good, fast car-driver but never dangerous, in spite of the fact that he might be carrying on long and technical discussions most of the time. He was a fine big man, and it was always a surprise to see him emerge from the baby Fiat, and generally a cause for amusement when the two of them (R.K.P. and himself) went off in this little car.

Sir Roy continued: "I would say that some of the chief characteristics that contributed to his success were his absolute integrity, his capability for taking infinite pains; his open mind and willingness to listen to criticism and to take advice. He was not only a big man in physical stature, but also in many other ways. He was

Left, Venom (Bristol Aquila) with retractable undercarriage and v.p. airscrew. Right, Wellington geodetic bomber with Bristol Pegasus engines.

"Flight" photograph





REMEMBERING REX PIERSON . . .

friendly, almost royal, in his approach, but always dignified. When need be he was able to say things, sometimes quite hard things, in an unobtrusive, telling way which many others could not do. There must be very few indeed of the considerable number of people that passed through his hands who would not say that there was an innate decentness in all his dealings with them," said Sir Roy. There was a kindliness but firmness and, generally speaking, people liked working for him.

Early in R.K.P.'s career Vickers had a private wind tunnel and he consistently made practical use of it. Throughout his whole career he sponsored the laying down of larger and more powerful tunnels by his company as progress demanded them. He had a balanced appreciation between the scientific and purely practical approach to aircraft design and manufacture which was a great asset to him and his firm, and was extremely rare 25 years ago. Aircraft designers, and particularly aircraft firms, were very secretive in the early days. As an illustration of his open-mindedness Rex Pierson was also willing to discuss, with people he trusted, what he was doing. He would invite competitors to come and see his work in a way that was quite exceptional, because he felt he could learn more than he lost by having their criticisms; and his firm was sensible enough not to oppose this enlightened outlook.

"He was reticent and retiring and absolutely 'un-swollen-headed' at any time in his professional life. In fact, I think he was retiring to a fault, and I sometimes told him so," said Sir Roy. He was entirely free from all business jealousy and lust for power, and in fact he was distinctly bored with this complex side of life in an up-and-coming industry, and preferred to be left alone to get on with his job.

Sir Roy continued: "I have heard some criticism that he kept too much to the centre of the road and that some of his designs were not as clean aerodynamically as they should have been. I do not think, broadly speaking, that this criticism was justified. R.K.P.'s long family of designs were for the most part most successful, and built up an excellent and lucrative business for the Vickers company, both at home and abroad. Most important of all, the cumulative effect over a long period of years of his sound engineering and great leadership came to its zenith most fortuitously at a very critical time in the history of this country, and enabled his firm to play a vital part in the gaining of air superiority in the Second World War."

Sir Roy next asked "In what practical way can we best do honour to Rex Pierson?" and he suggested that the answer was by ensuring that sufficient men of his calibre and vision were attracted into British aviation to carry on and further his pioneering work.

Before discussing this subject further, Sir Roy said that he had certain notes written by R.K.P. after the war, and from these he would hazard the following statements. R.K.P. did not subscribe to the big jumps being advocated at the time, and was in favour of steady progression. He was much concerned with the alarming increase in the cost and size of aerodromes and especially what would happen in the event of another war in this respect. He was worried about "buried" engines from an accessibility and fire-risk point of view, and was sceptical about the elimination of petrol giving much relief as regards the latter aspect. He wanted as few large engines as possible, and did not like gearing twin engines together—in fact, he was apprehensive about the gearing problems on turbines altogether. He was interested in pressurization and was very keen on better engineering in what he called the operational services. He was unconvinced about electrics. He was thinking quite a lot on the offensive and defensive armament of bombers, and was adamant about pressing on with aids for safety for bad-weather civil flying. Sir Roy said that Rex Pierson's balanced mind had grasped the necessity to install more aircraft research equipment as soon as possible after the war. He added: "I feel he would be disappointed to see the slow progress on this matter in the intervening five years since his death."

The lecturer felt that R.K.P. believed that, if the head of a future design-team was to be able to call his soul his own and have any home life at all, he must have a nucleus of top-flight technicians in their own particular fields (but also with a broad educational background) backing him up and sharing the load. He (R.K.P.) thought also that, broadly speaking, we were now beginning to feel the want of such people, might suffer seriously in the future if the gap was not filled, and that we had been fortunate in getting by so far with so few.

The lecturer then went on to discuss at some length the questions of technical education and preparation for responsible technical jobs in the aircraft industry in Great Britain, America and on the Continent. He concluded this section of his paper by saying that it was not long ago that there were no apprenticeship schools and youngsters had to fend for themselves and pick up what they could in the factory-shops. It was necessary to appreciate, as had other countries like Switzerland, Sweden and Germany, that to become a fully qualified technological engineer required as long and faithful study as certain of the older and more entrenched professions, and that such an engineer must be paid a living wage during the finishing-off process. Sir Roy summed up:—

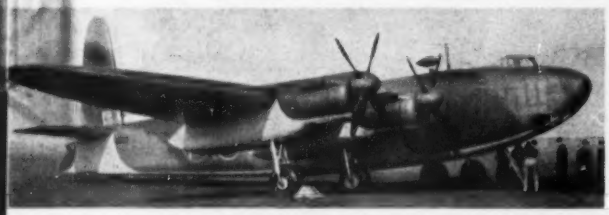
(1) We must be convinced and sure in our minds that this was an urgent realistic matter and not the vapourings of scaremongers, who wished to ride some particular pet hobby horse or elevate technicians on to an unrealistic pinnacle.

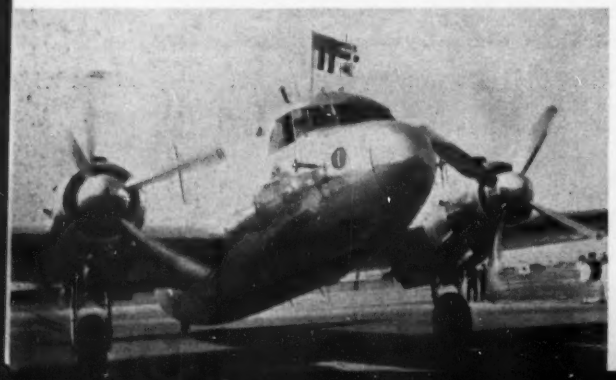
(2) We must appreciate that this was a long-term problem of profound importance to the life of the nation. We must go forward to the Powers that Be with a more concrete plan on this matter than had been attempted before, because at present it appeared too complicated to them, particularly as we were divided in our opinions, and therefore senior people were apt to sheer off it.

(3) We must influence and educate parents as to the great value and permanent opportunities offered by the right aeronautical technical training.

(4) We must convince the head masters of our public schools and the well informed hierarchy of this country, as well as the National Press, the Universities and other seats of learning, that a highly trained aeronautical engineer is a calling of the greatest importance, worthy of the best brains the country can produce, and just as vital and important to the community at large as the humanities and the present accepted "liberal" education of the traditional accepted professions.

(5) We must see that the Powers that Be provide the facilities in an adequate but not grandiose scale, pay the teachers properly, and were alive to the urgent need of the present problem, and do something about it.





Above, Windsor bomber (four Rolls-Royce Merlins). Below is a Viking (Bristol Hercules) of the Queen's Flight.

The Discussion

After the lecture an opportunity was given for discussion—mainly to enable some of those present to pay personal tributes to the memory of Rex Pierson. Mr. N. E. Rowe, chairman of the Branches Committee, first congratulated Weybridge on introducing "named" lectures, and recalled that he himself had at one time been an R.T.O. at Weybridge. He remembered Rex Pierson as an energetic leader, sure of himself, and always moving forward objectively.

Mr. W. E. Petter endorsed several of the lecturer's remarks, and in particular disagreed with any suggestion that R.K.P. kept to the middle of the road. He referred to his clean first-war bomber, the Venom light fighter and the Wellington. These showed that while keeping his factory full he was always looking ahead.

Mr. S. Scott-Hall believed that a number of people in this country were worried about production. It was a problem in which the R.Ae.S should take an active interest. All that Sir Roy Fedden had said about design teams bore with even greater interest on production teams.

Mr. Henry Knowler recalled that he had been interviewed for a job by R.K.P., who was chief technician at Vickers at the age of only 23 years. He said that two mistakes by others had given Rex Pierson his first chance. He mentioned the Barnwell Bullet, a small fighter—they called them Scouts in those days—with a 100 h.p. Gnome. There was trouble with the c.g. and Rex Pierson was asked to get it right. He was very weight conscious, and Mr. Knowler recalled that the estimate for the aircraft was 843 lb and his method of keeping the weight down was to have a bet on the weight figure with Maxwell Muller who was in charge of the building.

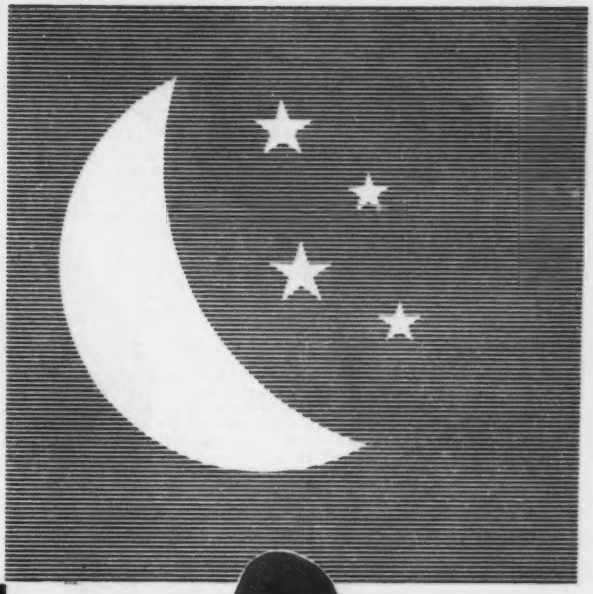
Mr. Knowler gave additional information about the Viking, the 20,000 lb Valencia which was a co-operative effort between Weybridge and S. E. Saunders at Cowes who was responsible for the hull. He also recalled another aircraft which did not get past the design stage but was indicative of far-sightedness in the year 1919. This was the Vigilant, a 110,000 lb aircraft with eight Condors in coupled pairs and 21ft diameter airscrews.

A vote of thanks by Mr. Peter Masefield concluded the meeting. He said that the aeronautical galaxy present was a tribute both to the subject of the lecture and to the lecturer himself. That for the first time people should be talked about instead of ironmongery was a sign that the aircraft industry was growing up.

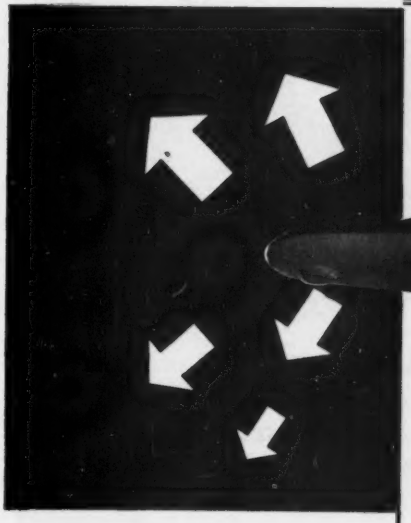
Following the lecture a number of those present were the guests of the Weybridge Branch of the R.Ae.S. and of the Vickers company at dinner. Mr. George Edwards in the chair, before proposing the toast of the Royal Aeronautical Society, read telegrams from a number of the pioneers in aviation who were prevented by illness or absence abroad from being present. Mr. Edwards also said that Vickers were delighted to have with them Rex Pierson's son Mike.

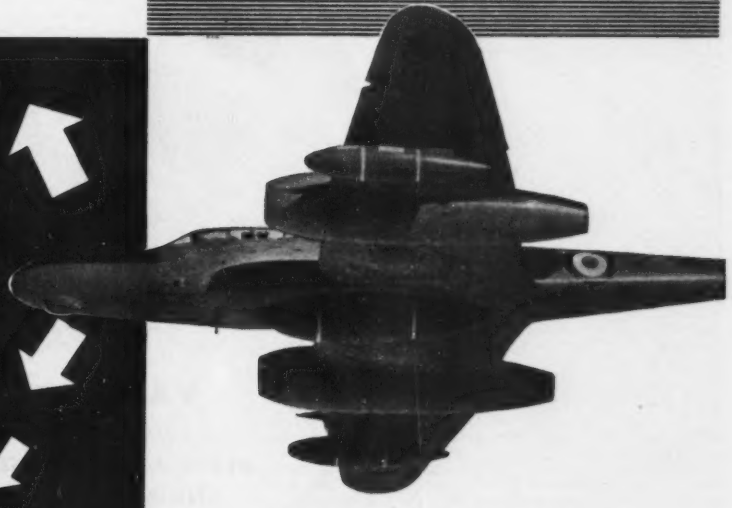
Mr. George Dowty, president of the R.Ae.S., responding, said that the Society was 86 years old, had a membership of 9,000 and its remarkable growth was in keeping with the spectacular achievements of its members. He thanked the Weybridge Branch.

Mr. H. H. Gardner, chairman of the Weybridge Branch, proposed the guests. The evening's conscientiously prepared lecture had brought pleasurable memories of Rex Pierson and his work. The final speaker, who expressed the thanks of the guests, was Major G. P. Bulman.



N.F.11
...its radar
turns night
into day





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Rotorplane Training

I THOROUGHLY enjoyed reading your article "Conversion to Rotating Wings" (October 31st) and I hope it is given the attention and thought it deserves, not only by the enthusiasts, but particularly by those responsible for framing helicopter conversion courses for Service pilots.

Experience indicates that no pilot can be considered reasonably safe under all wind conditions until he has acquired a minimum of 50 hours' dual and solo training. No matter how extensive is a pilot's background of fixed-wing experience, the minimum standard in the B.E.A. Helicopter Experimental Unit has always been 75 hours before carrying freight or mail, and 100 hours before carrying fare-paying passengers.

To hover and fly slowly appears easy to the uninitiated—but proper and facile co-ordination of controls can result only from intensive practice. Once certain prior conceptions are thrown overboard, and the knack acquired, then the whole process of pilotage naturally tends to become more easy.

To fly an Autogiro was child's play by comparison, and those who kid themselves and others that helicopter pilotage is "a piece of cake" just don't know what they are talking about. The only real limitation of the Autogiro was that it could not hover in still air; but the principle was sound and pilotage simple, as most pre-war amateur enthusiasts trained at Hanworth could readily testify.

Gatwick, Surrey. R. A. C. BRIE.

[W/C. Brie is in charge of the B.E.A. Helicopter Experimental Unit. For ten years, from 1930-1940, he was with the Cierva Autogiro Company. He holds Helicopter Certificate No. 1.—ED.]

High-speed Phenomena

ON the subject of condensation effects from high-speed aircraft, recently mentioned by correspondents, I first witnessed this during a high-speed run over Waterbeach R.A.F. Station by a 63 Sqn. Meteor 8 on a very damp afternoon; it was an entirely new experience and rather frightening, as it appeared that the aircraft was breaking up. Later that afternoon four similar aircraft, of 56 Sqn, exhibited the same phenomena, but these were flying considerably slower, and the "splash" appeared only as they pulled out of shallow dives.

I have also seen a Meteor T.7 of C.F.S. exhibit phenomena when pulling out of comparatively slow dives. These observations incline me to think that pressure-changes are the likely cause.

Though there might be difficulties owing to the large clouds of vapour produced, high-speed photography may resolve this, giving a method to supplement the striae system and perhaps the Schlieren process. But will the water droplets disperse sufficiently in a closed-return tunnel? And any tip loss at the tunnel propeller might produce a vortex in the saturated atmosphere.

Cambridge. PEDANTICA.

"Dinghies of the Air"

I DO NOT like the question mark you added to the heading ("Slow and Safe") of my letter in *Flight* of October 24th; nor am I satisfied with the editorial footnote that "low power and low speed are not necessarily conducive to safety." I imagine that very few people who are interested in small aircraft for the impecunious private owner do not thoroughly understand that insufficient power on a badly designed aircraft can cause vices. That was precisely why I appealed to our great aircraft firms and their master designers to help us out by providing aerodynamically sound little aircraft, instead of leaving the job to be sorted out by amateur endeavour.

The little aeroplane, akin to a "dinghy of the air," was very nearly a success in the 1923-24 Lympne Trials. It failed in two respects—the adapted motor-cycle engines utilized (except one or two small aero engines) were in those early days underpowered for their weight and not really reliable; also, the designers were mostly obsessed by high aspect-ratio and the resultant "large" aircraft involved. Tandems of lower aspect-ratio, and an interacting aerofoil set up, were not used.

In spite of all this, W.O. Manning managed to fly his comparatively large "little aeroplane," the Wren, with a motor providing only 7 b.h.p. flat out with a direct-drive airscrew—the stalling speed was only 22 m.p.h.

The situation today is entirely changed. Your associated journal *The Motor Cycle* informs me that the undermentioned 500 c.c. vertical-twin engines produce the brake horse-power shown against them. These engines are completely reliable, with low fuel-consumption and very little vibration to trouble a light airframe. Their power is more than double that produced by motor-cycle engines of similar c.c. in the 1923 Lympne Trial days. These could be used nowadays geared down by the adaption of the highly reliable enclosed primary chain, as used on the motor-cycle. I have not the slightest doubt that a good designer could produce a *really adequately powered* little "dinghy of the air," with the horse-powers available. These powers, for 500 c.c. are as follows: A.J.S. twin, 30 b.h.p.; Norton Dominator twin, 29 b.h.p.; Royal Enfield twin, 25 b.h.p. The last-named firm is now producing a 700 c.c. vertical twin weighing only 10 lb more than the 500 c.c. and developing 36 b.h.p.

Mr. Editor, it is useless your telling us that these horse-powers are insufficient to give us safe flight! But I still demand low stalling and landing speeds. Think how often the early airmen stepped out of a mass of wreckage unhurt after a bad landing *because the impact-speed was low*. And for heavens sake let us forget this absurd idea that a little "dinghy of the air" must be able to fly against a gale of wind from London to Timbuctoo—the sailing people get a lot of sport, and learn a lot about sailing, by choosing their weather and using protected waters.

Let us forget the god of speed for a moment and see what we can do at the other end of the very seriously neglected scale. Slow-speed flight has many unsolved problems, and can form a useful and diverting pastime. It would be nice to see more photographs and news about little aircraft in the pages of *Flight*, just to offset the rather one-track rut of near-the-speed-of-sound Service aircraft and jet airliners as our weekly diet.

Sandbanks, Bournemouth. C. E. BOWDEN.

"Khaki and Blue"

YOU were good enough to publish a review of my recent book *Khaki and Blue* in your issue of October 17th, but in order that your readers who have not read the book should not be misled I must protest against your reviewer's fantastic distortion of the book's object and presentation. It would appear that he merely glanced through the book without either grasping its tenor or noting the context where I have been critical.

After an opening soliloquy on loyalty your reviewer refers to my "135-page, non-stop attack on the organization, discipline and bearing of the war-time R.A.F. Regiment." This is completely untrue. I do not introduce the Regiment until half-way through the book—it was not formed until February 1st, 1942 (Chap. VII). My criticisms are of *R.A.F.* discipline and of the way in which the parent Service failed at first to modify its procedure for the upbringing of its child, the R.A.F. *Regiment*. In my own words on page 12, "Rather has it been my object to give a picture of the material from which, first the Ground Defence organization, and later the R.A.F. Regiment, were formed, and to show the background against which the ultimate fine achievement of the Regiment may be judged." Even where your reviewer appears to have noticed a detail in the book—the chopping up of sentry-boxes for firewood—he is unfortunate because the culprits, as I state, were "young soldiers" (Army) and not the R.A.F. Regiment which had not come into existence at that time.

In view of the obvious confusion in your reviewer's mind and the resulting serious misrepresentation of what *Khaki and Blue* contains, I feel justified in asking you to publish this letter.

London, N.W.8. RONALD SHERBROOKE-WALKER.

[Our reviewer comments: "I did not expect that Col. Sherbrooke-Walker would enjoy my review of *Khaki and Blue* any more than I enjoyed writing it or, for that matter, reading the book. But I resent his implication that I merely glanced through the book. His chief complaint seems to be that I have not distinguished between the early Ground Defence Organization and the R.A.F. Regiment which grew from it. Yet his criticisms fall impartially on both, and he implies that their duties, shortcomings and, to a degree, personnel remained the same after the change-over. If the book had justified a longer review, I would gladly have gone into more detail. I would also have asked why Col. Sherbrooke-Walker considers that large moustaches, as worn by some R.A.F. officers, 'should be forcibly removed by one's fellow-subalterns,' and why designers of the R.A.F. uniform were wrong in assuming that officers would spend their time 'in the air, in their offices or in the mess.' In short, I consider my review fair and adequate—which is more than most ex-R.A.F. Regiment readers will be likely to say about Col. Sherbrooke-Walker's book."]

THE INDUSTRY

Rolls-Royce Appointment

FROM Rolls-Royce, Ltd. comes the announcement that A. Cdre. E. R. Pearce, O.B.E., B.Sc., has been appointed North American sales representative of their aero division; he will be stationed with Rolls-Royce of Canada, Ltd.

A. Cdre. Pearce.

A. Cdre. Pearce, who was educated at Charterhouse and graduated at Manchester University with a B.Sc. degree (first-class honours), retired from the R.A.F. at the beginning of this month, after 20 years' service. Originally trained as a pilot, he took the specialist engineering course in 1936 and was subsequently assigned to the Imperial College of Science and Technology, where he was granted a diploma in aeronautical engineering.

For his pre-war work on pilotless aircraft A. Cdre Pearce was made an O.B.E. During the war years he was concerned with the production of Canadian- and U.S.-built aircraft, a task involving frequent transatlantic journeys. In 1944 he was posted to Australia on similar work and was associated with the manufacture in Australia of Merlin engines and Lincoln and Mosquito aircraft.

He returned to England in 1947 and, up to the time of his retirement, was concerned mainly with jet-aircraft maintenance as Command Engineer Officer, Flying Training Command.

Notes on Rubber

THOSE concerned with the development and use of components incorporating rubber will find a great deal of useful guidance in a technical memorandum produced by Precision Rubbers, Ltd., Bagworth, Leicestershire, under the title *Synthetic and Natural Rubbers and Their Uses*. The properties of these often formidably named materials (e.g., "butadiene-acrylonitrile copolymers") are reviewed, and their performance and durability under various conditions critically appraised.

Lubricating Jet Ancilliaries

CERTAIN gas-turbine auxiliary equipment may be called upon to operate under extremes of temperature, and among the problems thus involved is that of satisfactory lubrication.

One particular instance concerns hot (de-icing) air valves having actuators operated by motors through reduction-gearing. Initially, they may be at a temperature as low as – 50 deg C. (such a case would obtain during operation in arctic conditions); then, on their being brought into operation, the working temperature may rise as high as 175 deg C. A cold start is likely to result in a burnt-out motor if the gear-lubricant is frozen.

For such applications, Shell have developed a new lubricant, AeroShell Grease 12, which has received immediate M.o.S. approval. Produced after intensive research at the makers' aero engine laboratory at Thornton, Cheshire, the new grease contains neither soap nor mineral oil. Made with an inorganic gelling agent and synthetic oil, it is stated to have satisfactory lubricating properties over a very much wider temperature-range than can be covered by conventional greases; in fact, the manufacturers claim for it a range, depending on conditions, of between – 70 deg C and + 200 deg C.

Prizes for Fairey Apprentices

IN recognition of examination successes during the past twelve months, cash prizes were presented on November 11th to 30 apprentices from Fairey Aviation's Hayes group of factories. Nine apprentices who had obtained the Higher National Certificate each received a cheque for £10, and the remainder, successful in Ordinary National Certificate and City and Guilds Intermediate examinations, each received £5.

At the prize-giving ceremony, which was held in the canteen of the company's main factory at Hayes, Mr. C. C. Ferguson (labour adviser) spoke of the importance of a supply of well-trained ex-apprentices, on whom depended the continuation of the company's long tradition. Special mention was made of Denis Howe, previously an apprentice, who had received consecutively the Hele-Shaw Prize and Gold Medal of the Institution of Mechanical Engineers, an S.B.A.C. scholarship to the College of Aeronautics, the College Diploma with Distinction in Aircraft Design, and the I.Mech.E. Clayton Fellowship for a year's further research at Cranfield.

Mr. Richard Fairey (director) then presented the prizes, after affirming on behalf of the board the need for an effective apprenticeship scheme. With the improved premises and facilities now being prepared for the apprentice school, he said, the hope was for increased numbers of good technicians who would stay with the company and do the hard but interesting work that lay ahead. Eventually these men would occupy high places in the firm. Other company representatives present were Mr. T. F. Parke (works manager) and Mr. J. Jones (apprentice supervisor). The prize-winners were :—

Higher National Certificate.—P. E. Ayre, J. M. Dennis, B. H. Guest, E. T. Hill, R. W. Taylor, P. J. Jenkins, E. N. Smith, P. J. Sole, J. D. Warrin.

Ordinary National Certificate.—A. J. Benson, J. Boddy, C. F. Cook, R. E. De'Ath, A. W. Elliott, P. R. Frost, S. J. Heighes, B. D. Hope, W. T. Jarman, E. S. B. Johnson, G. C. Lind, D. P. McQuire, H. A. Money, R. G. Rough, J. E. Williams.

City and Guilds Intermediate Examination.—Sheet-metal work, L. Pash; Carpentry and Joinery, D. J. Swift; Machine-shop engineering, J. R. Cadenhead, R. M. Salvage, C. J. Burchett, R. E. Greenland.

Infra-red Heating

AN adaptable and efficient method of heating containers, pipes, valves and other components of industrial and laboratory plant is provided by "Stabilag" infra-red jackets. Consisting of Fibreglass or quartz-cloth, one layer of which contains a closely pitched resistance wire, they are "tailored" to fit the component to be heated; a metal shell encases the jacket. Typical applications are illustrated in a leaflet obtainable from the makers, the Stabilag Co., Ltd., 1 Broad Street Buildings, London, E.C.2.

Family Affair

THE Owen Organization recently held an informal dinner party at the Midland Hotel, Manchester. Their chairman, Mr. A. G. B. Owen, O.B.E., in welcoming the several hundred guests, said that it was the first occasion that they had held one of their gatherings in the North. He thought that such a getting-together of suppliers and customers during the present difficult period of shortages of materials was a very good thing. The organization had grown from a small family business and, although its present ramifications were on a much bigger scale, they were proud to still retain the old family spirit and tradition.

IN BRIEF

PLESSEY E.H.T. concentric cable-connectors, in two types intended mainly for laboratory and factory use respectively, are described in a new brochure from the Plessey Co., Ltd., Ilford, Essex.

* * *

Export Packing Service, Ltd. (whose work for the aircraft industry in the preparation of airframes, engines and components for export is well known) have acquired more commodious London offices. They are now at Imperial House, 56 Kingsway, W.C.2 (Chancery 5121).

* * *

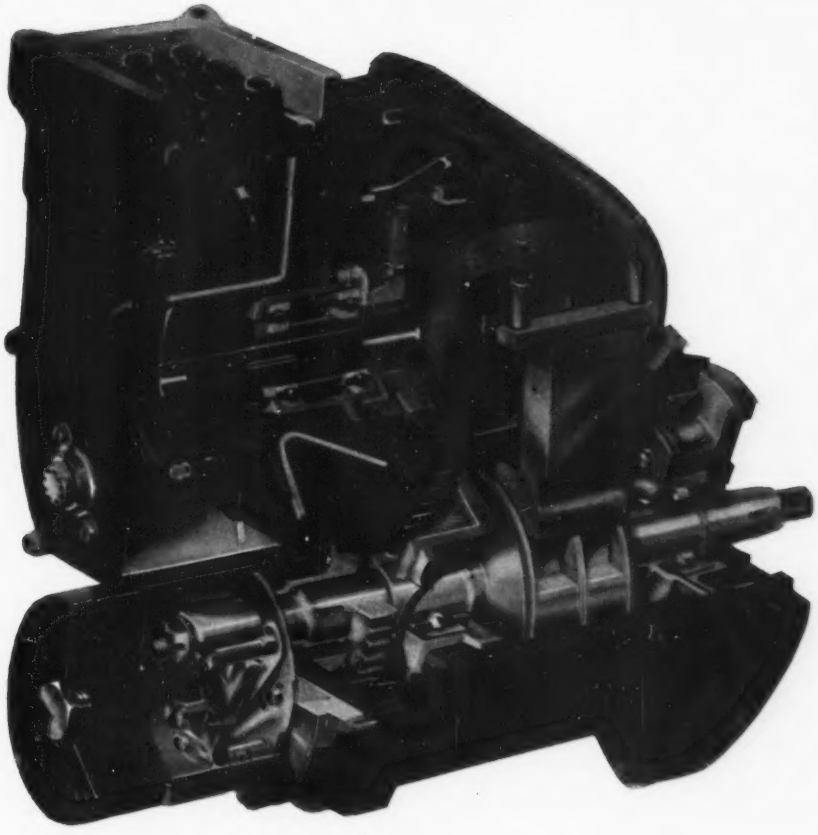
Though primarily of concern to rail- and road-transport engineers, Technical Booklet No. 12 of the Fire Protection Association (84, Queen Street, London, E.C.4) contains much useful information : its subject is *The Surface Spread of Flame on Surfaces Treated with Nitrocellulose Lacquers*.

* * *

New British Standards recently published include Nos. L.70-L.73, for four specifications of Duralumin sheet and strip, alternatively (*a*) solution-treated and aged at room temperature and (*b*) solution-treated and precipitation-treated. Copies are obtainable at 1s each from the British Standards Institution Sales Branch, 24 Victoria Street, London, S.W.1.

* * *

Smiths Aircraft Instruments, Ltd., state that most of the instrumentation of the Fiat G.49 trainer—described in *Flight* of October 24th—is of their manufacture. The present specification, they say, includes altimeter, airspeed indicator, emergency compass, boost gauge, engine-speed indicator and generator, oil pressure and temperature indicators, fuel pressure and air temperature indicators, cylinder thermometer, air thermometer, flap-position indicators, ammeter, voltmeter, fuel-pressure warning switch, and Smiths-Waymouth fuel contents indicating system.



Rotax 12-cylinder engine magneto

Progressively developed from the original magnetos used on the Hurricanes and Spitfires, the latest version of these famous magnetos is now standard equipment on the Rolls Royce " Merlin " reciprocating engines used by:

British Overseas Airways Corporation ;
Trans Canada Airlines ;
Royal Air Force ;
Royal Naval Air Service ;
Royal Canadian Air Force ;
United States Air Force.

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CIVIL AVIATION

THE FUTURE OF CROYDON

FOLLOWING a recent report that Croydon Airport is to be closed within the next few years as part of the scheme for controlling the growing air traffic to London, the Town Clerk of Croydon asked the Ministry of Civil Aviation for an official statement. The Ministry, in replying, was unable to confirm whether or at what date the airport would be closed, stating that its future use was linked with that of a number of other airfields in the London area, and that no decisions had yet been taken. It was definitely stated, however, that the restricted size and other operational limitations of Croydon made it unsuitable for further development.

Croydon's main limitations are the proximity of the London Airport holding area over Epsom and the impossibility of extending the three grass runways (all less than 4,000ft in length) to take larger aircraft. No further construction is being undertaken at the airport, from which five charter companies operate at present. In 1946 the number of charter concerns using the airport was 37; the remaining operators (writes a correspondent) have no fears for the future since they have been concentrating on discovering how and where they can best work without trying to compete with the regular airlines. Their main selling point, he writes, is that "you can take a bus almost anywhere in London for a few pence, but there is still a demand for an efficient taxi service." There is no question of these charter companies ceasing to operate when Croydon closes; in fact, there would be many advantages in operating from Gatwick. Journeys to the Continent would be slightly shorter, and Northern passengers might be tempted to fly to Gatwick as it is farther from London, instead of travelling by train to the airport from the London termini. At present, on a busy day with bad weather, a charter aircraft waiting to land at Croydon, may spend up to 40 minutes holding over Epsom—an expense which could be almost eliminated by the use of Gatwick.

Local councils in the Croydon area will not be able to make any plans for the airport, which stands on ground belonging to the M.C.A., until the Ministry intimates whether or not it intends to release the land. The Wallington Council, in whose territory the major part of the airport lies, are reported to be considering the idea of building a model village on the site. In the immediate future, however, there may be an increase in flying activity at Croydon, due to the transfer, early in the New Year, of the Airways Aero Club. At present based at Denham, the Club is kept busy training B.O.A.C. navigators and B.E.A. radio officers as pilots. The proposed move to Croydon is now under consideration, and a decision is expected by the end of the year.

PRESTWICK ANNIVERSARY

A DINNER was held at Prestwick on November 14th by Scottish Aviation, Ltd., to celebrate the twelfth anniversary of transatlantic air services to this Scottish airport. Guest of honour was Mr. A. T. Lennox-Boyd, the Minister of Civil Aviation, who reassured his audience that the Government's determination that Prestwick should be Britain's second international airport remained completely undisturbed by developments elsewhere. Referring to Scottish Aviation claims for compensation to cover M.C.A. acquisition of property at Prestwick, he said that the case would be heard by an arbiter the following Monday. Although the solution was not likely to be entirely acceptable to either side, Mr. Lennox-Boyd looked for an early statement; the sooner the difficulty was cleared up the better for everybody.

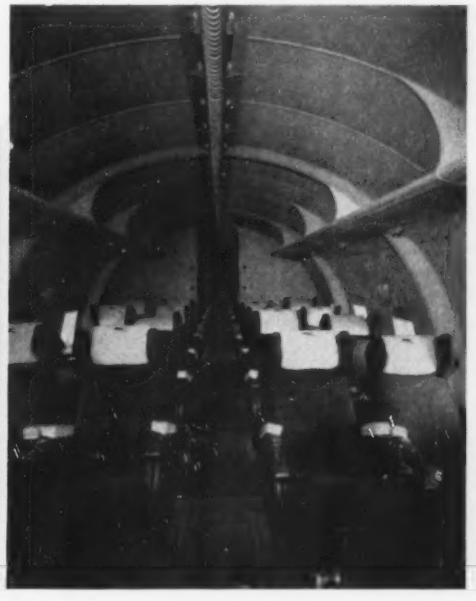
Prestwick, he said, had a great future whatever form its development might take. He knew of the fear that Ringway might steal a march on Prestwick; he thought the future of the Manchester airport lay broadly in Continental development, although it must always be the passenger who would, in the long run, settle the question of any airport development.

Discussing the question of Scottish services, Mr. Lennox-Boyd reiterated that it was a formidable task to amputate a section of any internal air route, so as to provide opportunities for private companies, without increasing the financial burden of B.E.A. He regarded as of the utmost importance the need for providing cheap and efficient services for the people, but the overwhelming obligation remained to see that whatever they did was not done at the expense of the British taxpayer.

NEW BRISTOL 171s ORDERED

NEWS of a resumed passenger helicopter service between London and Birmingham next summer is given in a joint announcement by the Bristol Aeroplane Company and British European Airways. The services will be operated with two newly ordered Bristol 171 Mk 3A single-rotor four-passenger machines due for delivery in June 1953. The type 171 Mk 3 rotorplane already in service with B.E.A., which is engaged on development work and crew training, will shortly be used for freight services on

HIGH-DENSITY HERMES: Last Monday, as reported on page 656, B.O.A.C. introduced tourist fares on the London-Nairobi route. The aircraft used on this and other cut-fare services between Britain and Africa are Handley Page Hermes IVs modified to carry 56 passengers (below) instead of 40, as in the standard first-class version (right). The Corporation operates a fleet of 19 Hermes IVs; five have already been converted to 56-seaters and 12 more will shortly be adapted.



CIVIL AVIATION . . .

the same route. The Mk 3A will be a slightly modified version incorporating a side exhaust, revised instrument panel layout, Decca navigational aids and a redesigned fuselage giving greater luggage space behind the engine. All-up weight will be increased by 100 lb to 5,300 lb.

NEWS FROM CANNES

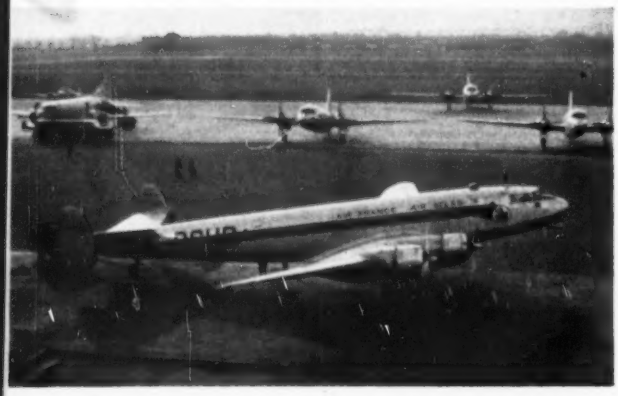
SOME of the agreements reached unanimously between airline representatives attending the current I.A.T.A. Traffic Conference at Cannes were announced last week. The most important question on the agenda, that of settling the exact fares to be charged on forthcoming European (and, possibly, Pacific) tourist services, has not yet been settled, and at the time of writing the conference was expected to continue for several days. One outstanding matter has, however, been resolved: the scale of commission to be paid to travel agents for both first-class and tourist air bookings. As from January 2nd next, a standard rate of seven per cent will be paid on all international sales for both types of service. An extra one-half per cent will be paid on tickets sold and used entirely within Europe. For tickets sold and used within certain parts of the Middle East and Southern America airlines will continue to pay five per cent and the same rate will be retained for cargo agents. At present the airlines pay seven and a half per cent on all sales other than for North Atlantic tourist tickets, on which the rate is only six per cent.

Broadly speaking, the I.A.T.A. decision represents a success for European interests. Most American airlines, depending less on agents for their ticket sales, were in favour of the lower rates of commission, which British agents regarded as insufficient to cover their sales costs. A decision to impose a standard commission rate of, say, six and a half per cent, might well have resulted in a decrease in European airline traffic.

Asked to comment on the new scale of commissions, Mr. R. A. Loraine, Air Travel Manager of Thomas Cook and Sons, Ltd., told us: "The I.A.T.A. decision on rates to be paid in Europe indicates that the airlines have shown a realistic approach to the situation arising through the increase in traffic due to tourist services. As for the rates outside Europe, the agents will do their loyal best to see if they will work in practice. They appreciate the honest desire of the airlines to reach an equitable solution to the problem."

It was also announced at Cannes by Mr. Dennis Handover of Scandinavian Airlines System, chairman of the Conference, that member airlines flying within and into the United States and Canada would publish their future time tables in local time only so long as the North American domestic airlines agreed to do the same. Confusion, he said, had arisen from the existence of four time zones across the North American continent. The passenger did not care what time it might be in relation to standard time or Greenwich time or any other theoretical clock; he merely wanted to know what the hour would be in the city he visited when he arrived there. The proposal is being considered by the Air Traffic Conference of the North Atlantic domestic operators this week. The Cannes conference also agreed to include in the structure of internationally agreed tariffs regular fares and rates for airborne car ferry services, such as those operated across the English Channel and "being contemplated on routes serving Ireland."

An application by Silver City for full membership of I.A.T.A. was, incidentally, approved by the Association's executive committee last July. The company's method of booking through motor, motor-cycle, and cycle organizations, however, differs from normal airline practice, constituting a stumbling-block to I.A.T.A. membership. Following a message from the secretary of the Cannes conference saying that I.A.T.A. was unlikely to agree to permit this method of booking, Silver City decided to withdraw their application if there is no change of attitude on the part of I.A.T.A.



UNDER TWO FLAGS: One of two S.E. Languedocs operated by Air Atlas, pictured at Le Bourget. This machine is unusual in bearing the insignia of both Air Atlas (which is based on Casablanca and operates both domestic routes in Morocco and services to France) and of the parent company, Air France, which supplies Air Atlas with aircraft and aircrews.

PRIMING THE PUMP

SPEAKING to the Airbrokers Association in London last week, Mr. Philip Bremridge, director of B.I.A.T.A., put forward a plan for assisting the independent operators to buy new aircraft. He suggested a "finance corporation for air transport," which could order the new aircraft needed, make the cash payment required by the manufacturer with the order, and, on delivery, rent them to the operator on a hire-purchase agreement. As a guarantee the Air Ministry should undertake to buy the aircraft from the corporation at market price in the event of failure of the operator. It was true that the risk of the Air Ministry having to redeem their guarantee was very remote but some guarantee was necessary for an investment which at any time might approach £30-50 million.

SHORTS IN SERVICE

A REMARKABLY wide range of duties is being performed by Short Sealand Mk I twin engine amphibians, of which 23 have been built or are in process of completion. As yet, the Mk II flying-boat development is in the project stage, although two Mk Is operated by the Norwegian concern Westlandske Luftfartselskap between Bergen and Trondheim have been converted to flying-boats by removal of their undercarriages. Two more Sealands are in regular service on the Dalmatian coast with Yugoslovenski Aerotransport. The machine operated by the Christian Missionary Alliance in Indonesia was recently abandoned in a damaged condition in Djakarta and cannot be salvaged due to local hostilities. Three Sealands are based on Dacca, where they are used mainly for liaison duties—two by the East Bengal Government's Transport Commission and one by Ralli Brothers, a jute company. Yet another is based on Cairo, where it is used as a personal executive aircraft by Mr. Ahmed Abboud. Three of the latest versions with Gipsy Queen 70-4 engines are being supplied to the Royal Indian Navy; they will be used for naval communications duties and based on Cochin.

There is also news of larger Short marine aircraft—the famous Solent flying-boats, of which only five are in regular service (three with Trans Oceanic Airways, one with Tasman Empire Airways and one with Aquila Airways). Of the remaining Solents built for B.O.A.C., 11 are stored at Belfast and two have been destroyed in accidents. At least one private operator is reported to be considering the possibility of returning some of these excellent machines to service, but the price demanded by the Ministry of Supply (£30,000) is regarded as too high; it has been estimated that at least £30,000 more would have to be spent on making them airworthy after the long storage-period.

MORE TOURIST SERVICES

STRATOCRUISERS will be used by Pan American World Airways for new cut-fare services to Honolulu from San Francisco and Los Angeles. These services will begin, subject to C.A.B. approval, on December 3rd; they will inaugurate tourist-class air travel in the Pacific area. Fares will be cut by some 25 per cent and the Stratocruisers will carry 81 passengers instead of 64. The present first-class Stratocruiser services to Honolulu from San Francisco, Los Angeles, Seattle and Portland will be maintained.

B.O.A.C.'s first tourist service to Africa—between London and Nairobi—was inaugurated on Monday. Initially, there will be three flights weekly between these points, *via* Rome, Cairo, Khartoum and Entebbe, in addition to two standard services—one *via* Khartoum and the other *via* Aden. Single and return tourist fares are £110 and £198, compared with the standard fares of £154 and £277 4s. Today (Friday), B.O.A.C. were also due to inaugurate twice-weekly cut-fare services to Dar-es-Salaam. All the Corporation's African tourist services are being operated with Hermes IVs, modified to carry 56 passengers instead of 40.

Colonial coach services (in slower aircraft, with more stops and at lower fares) between Nairobi and London are at present being operated by two British independent companies, Airwork and Hunting Air Transport, which recently announced reductions of £6 and £14, respectively, in single and return fares (formerly £98 and £180); this compensates passengers for a reduction in free-baggage allowance. Central African Airways will open coach services on the route early next month; like the British companies, C.A.A. will use Vikings, one of which completed a proving flight last week.

AT GATWICK, base of B.E.A.'s Helicopter Experimental Unit, are seen the three types of rotorplane used by the Corporation: Sikorsky S-51 (foreground), Bristol 171 and Bell 47. A B.E.A. order for two new versions of the Bristol 171 is reported on page 655. "Flight" photograph

I.C.A.O. MOVE

THE Council of I.C.A.O. has recently authorized the Secretary General to change the site of the organization's Far East and Pacific office from Melbourne, Australia, and to negotiate with the Thailand government for the establishment of this office in Bangkok. The office has been in Melbourne since the beginning of 1947, with the full co-operation of the Australian government, but the purpose of the proposed move is to bring the office to the mainland of Asia, closer to the centre of activity of the area which it serves. This area includes the I.C.A.O. member-states of Australia, Burma, Indonesia, New Zealand, Philippine Republic, and Thailand; and dependent territories of Australia, France, New Zealand, Netherlands, Portugal, Britain and the U.S.A.

C.A.B. NEWS

IT was announced recently by Mr. Donald Nyrop, chairman of the U.S. Civil Aeronautics Board, that refund payments to the Board of airmail subsidy payments made to U.S. airlines had totalled $11,311,000 (£4,040,000). The new airmail rates established by the Board were expected to reduce the cost of airmail payments by some $13 million (£4,640,000) per year. During 1951, 93 per cent of the total revenue received by U.S. civil airlines came from non-airmail sources, compared with 67 per cent in 1938, and annual commercial revenues during this period had increased from $26 million (£9,385,000) to $50 million (£17,857,000). The Board's 1951 policy, calling for additional low cost air coach service, had resulted in a substantial and steady increase in this form of transport.

CHARTER NOTES

DURING the seven days ended November 15th the reported air-charter activities of Britain's independent air transport companies showed signs of continuing good progress in winter business; loads carried, distance flown and revenue earned were all well above average. Altogether, some 135 *en route*, or non-positioning, flights were completed, 110 of them on the air ferries emanating from Berlin. Of the overall total, 107 were freight runs and 28 were passenger flights; in all some 102,000 miles were covered, 68,000 with cargo and 34,000 with passengers. Freight lifted amounted to approximately 688 tons; the number of passengers carried was about 1,360. For comparative purposes the week's work is estimated to have produced 199,000 freight ton-miles and 1,164,000 passenger miles (106,000 more ton-miles).

As usual, the busiest type of aircraft was the York, with Air Charter, Eagle and Skyways contributing roughly 20,000 miles apiece to give a total of 60,000. Silver City's Bristol 170s came next with 29,000 while B.K.S. covered about 13,000 miles with their Dakotas. Flying time was around 600 hours and the probable resultant revenue some £52,000.

During the week Eagle Aviation successfully tendered for three York flights to Nairobi; these trips do not strictly comprise a long-term trooping contract, although Service personnel are to be carried; for the sake of maintaining a stable basis for comparison of weekly charter business, however, we are not including the relevant statistics among our usual analyses. It must also be recorded that, with effect from November 15th, Scottish Airlines were due to become York operators and to begin their new North Atlantic air-cadet trooping contract to Montreal.

Reverting to last week's activity, Silver City were again among the busy companies which had to refuse work through shortage of aircraft. As a result of running extra services on the cross-Channel car ferry during this winter, the company is in a similar position to other large private airlines with heavy trooping commitments. In Berlin, Silver City flew 245 tons of freight, in 49 trips to Hanover and Hamburg; they also made three trips with freight, about 13 tons, to destinations in North Africa; additionally, 14 tons of cheese was flown from Le Touquet to Lympne and 5 tons of miscellaneous freight flew by Bristol 170 from Bovingdon to Paris.

Eagle Aviation had another of the long trips in which they seem to specialize; this time they effected an exchange of 42 seamen each way between London and Singapore. Skyways also flew out to the Far East on their regular Bangkok freight run for K.L.M. Another of their Yorks flew 16,000 lb of newspapers from Manchester to Dublin. A further job for Skyways was to fly a load of freight out to Nairobi for B.O.A.C.

B.K.S. Aerocharter took 24 passengers to Karachi and called in at Ankara on the way home to pick up a ship's screw for delivery to Le Touquet (for Calais). Another job was to take 24 passengers to and from Cyprus for the N.A.A.F.I.

RECENT PARLIAMENTARY ANSWERS

AMERICAN Jet Airworthiness Requirements.—The Minister of Civil Aviation, Mr. Alan Lennox-Boyd, said that the U.S. authorities had not, as yet, established their own airworthiness requirements for jet-engined aircraft and, until they did so, were unwilling to agree to the same degree of reciprocal recognition of Cs. of A. as had been accepted for piston-engined aircraft. They had, however, indicated their willingness to deal with any particular type on an *ad hoc* basis, and it was hoped that technical discussions to this end would be started shortly.

Mr. Lennox-Boyd was replying to questions by Mr. Fitzroy Maclean (Con., Lancaster) and A. Cdre. A. V. Harvey (Con., Macclesfield), who complained that the matter of recognition seemed to be a very one-sided affair. The Minister said he was sure that, in this as in every other field, the United States would act to us as we had acted to them—as generous allies.

Tudor Disposals (question by Mr. Frank Beswick—Lab., Uxbridge).—Mr. Lennox-Boyd said his department owned ten Tudors, plus four which were held for breaking down into spares. It would be contrary to normal contract procedure to publish details of individual offers, but he could say that offers around £10,000 apiece "as is" would be considered.

He denied that this price represented an element of "hidden subsidy" to private operators. As the aircraft cost £8,000 to £10,000 a year to maintain, he thought it would be fantastic not to accept the first good offer that came along.

East Africa Fares (by Mr. Beswick).—Mr. Lennox-Boyd, asked why it was necessary to widen the gap between Corporation air fares on their East African route and the air-coach service provided by independent operators, replied that a reasonable gap was necessary between the fares on tourist and Colonial coach services to ensure that each catered for a different class of traffic. As regards the East African route, he had approved the recommendation from the A.T.A.C., based on proposals agreed between the Corporation and the independent operators, that the fares on the Colonial coach service to Nairobi should be reduced. The proposal was also subject to the approval of the East African authorities. He said the reductions involved would be : B.O.A.C. tourist fares, 28 per cent less than standard; colonial coach, 40 per cent less (instead of 30).

I.C.A.O. Convention (by Mr. Reader Harris—Con., Heston and Isleworth).—Mr. Reginald Maudling, the Parliamentary Secretary, said that Britain was among the 32 countries which attended the recent I.C.A.O. Conference in Rome, but had not yet signed the Convention. When the Convention had been ratified by the five states it would come into force between them. After signing and ratifying the Convention, the United Kingdom would be left free to require the liability of foreign aircraft flying over U.K. territory to be covered by insurance or other security. The Minister was satisfied that the scale of liability under the Convention provided for reasonable compensation in all circumstances that could be foreseen.

London Airport Extension (by Mr. Reader Harris).—Mr. Maudling said a decision on whether it might be necessary to extend London Airport north to the Bath Road must await the completion of practical experiments now in progress. He thought a decision would be reached in a matter of weeks.

DOLLAR EARNER: As this issue closed for press, first news was received of a Trans-Canada Air Lines order for Vickers-Armstrongs Viscount turboprop airliners (the Series 700 prototype is pictured here at Dublin Airport). According to unconfirmed Canadian reports, the T.C.A. contract is worth $10m, and involves at least 14 aircraft.

CIVIL AVIATION . . .

BREVITIES

BOTH the British and French Governments offered to act as hosts to the seventh session of the assembly of I.C.A.O., which will begin on June 16th, 1953, and is expected to last about four weeks. In view of the small number of international aviation meetings held in the U.K., the French Government withdrew its invitation, and the Council of I.C.A.O. accepted the British offer to hold the assembly at Brighton.

* * *

An interchange agreement was signed last week by the presidents of United Air Lines, Braniff International Airways and Continental Airlines. Subject to C.A.B. approval, the agreement will provide for through services between the N.W. Pacific area and major points in Texas, Kansas and Oklahoma, with Denver as the interchange point.

* * *

I.A.T.A. has published in the form of a 252-page book the verbatim transcript of the airborne radio-equipment symposium which formed an important part of the technical conference at Copenhagen last May. Copies (price £1 5s) may be obtained from the Manager, I.A.T.A. Clearing House, 30 Curzon Street, London, W.1.

* * *

Mr. R. G. McCoy, general manager of Central African Airways, who was fined £50 for assault by caning an air hostess who had failed to strap herself in when an aircraft was landing, handed in his resignation immediately after the case had concluded. The following day (November 17th), a meeting of the airline's staff association, which represents all employees except pilots, passed a vote of confidence in Mr. McCoy.

* * *

Largely as a result of the reduction in fares on the London to Scotland route, the number of passengers carried on this and the London-Northern Ireland route increased by 150 per cent during the first week of November compared with the same period last year; the number of seats sold in London alone was 1,614 compared with 622 last year. The number of passengers carried on the entire B.E.A. network in the same period was nearly 6,000, 25 per cent more than in the corresponding week of 1951.

* * *

Following the reopening of their European sales office, Northwest Airlines have announced the appointment of Mr. Morley F. Emerson as their new European Sales Director. Mr. Emerson joined N.W.A. in 1948 and for the past two years has served as district sales manager in Milwaukee. His company operates U.S. domestic and Pacific services with a large fleet which includes ten Stratocruisers and 22 DC-4s.

* * *

Salaries paid to radio mechanics employed in civil aviation are at present the subject of dispute between the M.C.A. and the Civil Service Union. The Civil Service Arbitration Tribunal will hear the case on November 24th and its findings are expected to be made early in December. At present the salary-scale is £370 at the age of 25, rising with £20 annual increments to £450 at 31. They are asking for a new scale of £460 at 25, rising to £570.

* * *

It was recently announced in the House of Lords, by Lord Leathers, that B.O.A.C. had anticipated one of the recommendations of the French investigation into the forced landing by a Hermes in the Sahara by requiring the holder of a flight navigator's licence to be included in the crew of aircraft operating on the Tripoli-Kano route. The other recommendations, he said, were being actively considered.

Reporting the fifth anniversary of its special flights (charter) division, K.L.M. announces that its spare aircraft have flown 45,000 hr in the course of 2,150 flights during this period. Passengers were carried on most of the charter flights, the total being 64,000. Animals and freight, weighing a total of some 2,500 tons, were carried on the remainder.

* * *

Progress made by Philippine Air Lines in widely varying fields of activity has been recognized by two American industrial awards: a trophy presented by the American publication *Financial World* for the best annual report of any international airline, and an award of merit from the National Safety Council of America for "outstanding industrial employee safety."

* * *

Air France will operate 78 flights weekly between Germany and France during the winter season, using 55-seat DC-4s. Fares on the company's German network were recently reduced by 25 per cent, examples of the new fares being Paris-Dusseldorf (£6 17s single) and Paris-Frankfurt (£8 4s).

* * *

P.A.W.A. have announced plans for building a $500,000 overhaul shop at San Francisco Airport, so that the airline can take over from the Pacific Air Motive Co. at Burbank the task of performing major engine overhauls for the entire Clipper fleet of the Pacific-Alaska division.

* * *

Opening of an air ferry for cars and passengers between Southampton and Bembridge, Isle of Wight, is expected to result from recently announced plans to increase the length of the main Bembridge grass runway to 4,250ft—an extension of some 2,000ft. Silver City Airways have held a licence to operate such a service since April, 1952, but airport facilities on the island were insufficient to permit use of the company's Bristol Freighters. Southampton was used during the past summer as a base for the S.C.A. cross-channel service to Cherbourg.

* * *

A profit of £622,894 (overall surplus, £149,602) was made by B.O.A.C. during the first half of the current financial year—the period April 1st-September 27th. This compares with a profit of £1,233,722 and an overall surplus of £274,999 during the corresponding period of the 1951/52 financial year. In a message to the staff of the Corporation, Sir Miles Thomas gives two reasons for the decline in fortunes: the fuel strike caused a loss of £250-300,000 in May and June; and the volume of mail carried by B.O.A.C. has dropped by £1,250,000 a year. Reminding his staff that the lean winter months lie ahead, he calls for determination to maintain B.O.A.C.'s reputation as a profitable airline: "We must make every possible economy in costs and sell as hard as we can."

TRI-PACER: Piper's 1953 version of this popular four-seat lightplane is powered by a 135 h.p. Lycoming O-290-D2, giving a cruising speed (on 75 per cent power) of 134 m.p.h. at 7,000ft. Fuel capacity is 36 gall, providing a cruising range of 580 miles.

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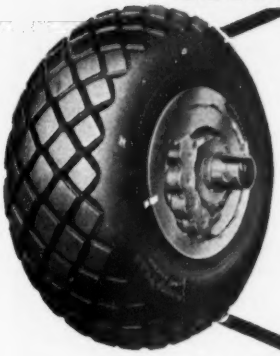

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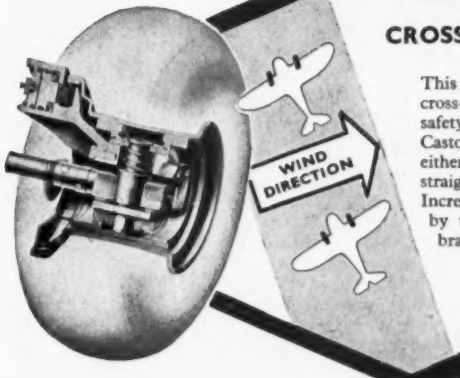

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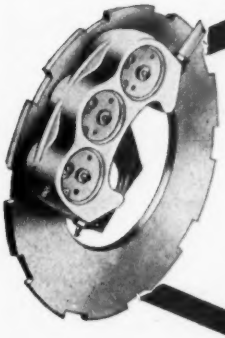

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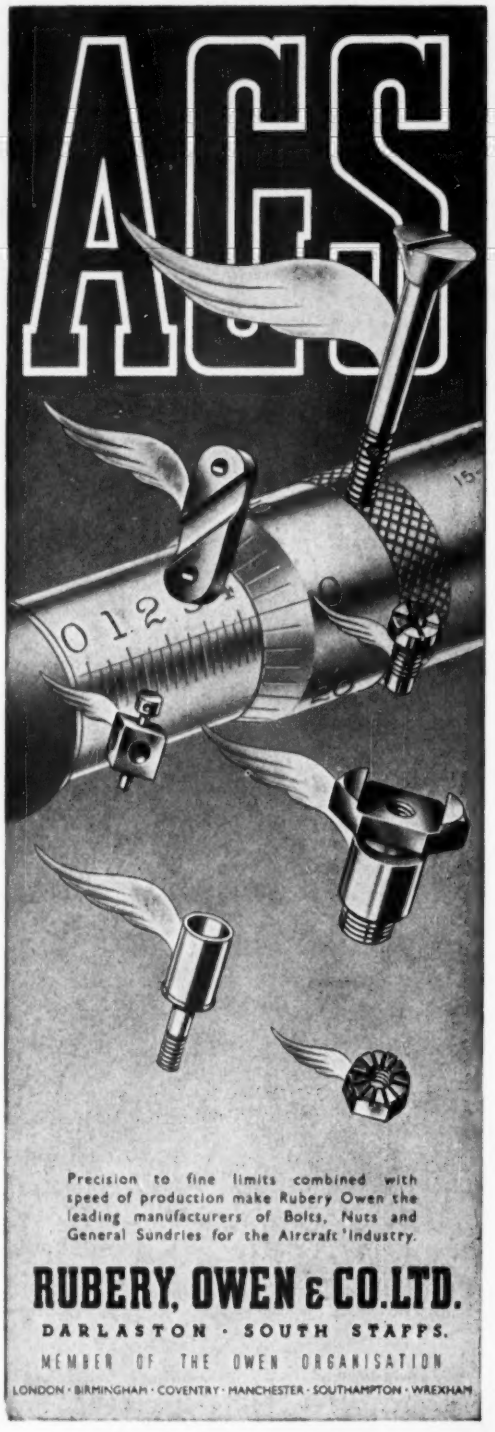
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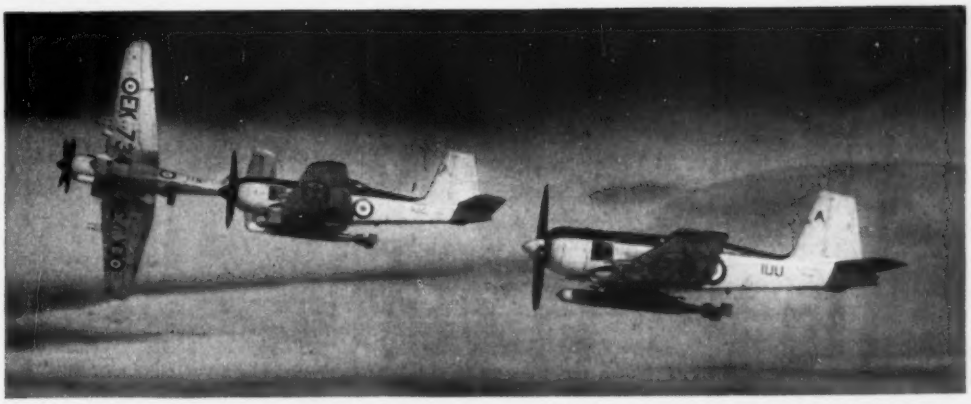

FROM LEE-ON-SOLENT: A torpedo-carrying Firebrand peels off from a formation of three during an exercise over the English Channel. The aircraft are from No. 813 Squadron, R.N., commanded by Lt. Cdr. A. D. Corkhill, D.S.C., R.N.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

Queen at Home Air Command

HER MAJESTY THE QUEEN is expected to visit Home Air Command at Lee-on-Solent today, November 21st. On arrival by train, at Fort Brockhurst, she is to be met by the Duke of Wellington, the Lord Lieutenant of Hampshire; Mr. J. P. L. Thomas, M.P., First Lord of the Admiralty; Admiral Sir John Edelsten, C-in-C. Portsmouth; and Alderman C. B. Osborn, J.P., Mayor of Gosport.

Twelve naval Westland Sikorsky Dragonfly helicopters of No. 705 Training Squadron are to escort the entourage from Fort Brockhurst to the Royal Naval Barracks. One Dragonfly will take station on each side of the Royal car and the remaining ten will follow in formation. On arrival at Lee-on-Solent the Queen will be received by Vice-Admiral Lambe, Flag Officer Air (Home).

Before lunching at Admiral Lambe's house Her Majesty is likely to drive slowly along the perimeter track and runway, where officers and men from each of the 17 naval air stations in Great Britain will be drawn up. Various aircraft types will also be lined up for her inspection and it is expected that she will leave her car and inspect a representative body of officers and men. In the afternoon, weather permitting, Her Majesty will watch from the control tower a fly-past of squadrons of Home Air Command.

On leaving Lee-on-Solent for Fareham Station the Queen intends to make a detour in order that the royal car may pass between the ranks of the ship's company of H.M.S. *Collingwood*, the naval electrical school.

Gordon Shephard Memorial Prize

THE prize-winners of the 1951-52 Gordon Shephard Memorial Prize Essay Competition are: W/C. C. N. Foxley-Norris, D.S.O. (1st); F/L. C. H. Burgess (2nd); F/L. J. R. Every (3rd); and S/L. F. A. Coleman, B.A. (4th). Forty-two entries were received.

The problem set was: "It is generally conceded that air superiority is a pre-requisite to success in a land or in a sea offensive against a major power. It is also a pre-requisite to success in an air offensive. It may even be that, if air supremacy can be won, the enemy will have lost all hope of victory. Can it indeed be said that the defeat of the enemy air force is the first task of a nation at war with a major power?"

Imperial Defence College Course

THE following senior officers have been selected to attend the 1953 course at the Imperial Defence College: *General Duties*: A. Cdre. E. M. F. Grundy, O.B.E.; A. Cdre. J. R. Hallings-Pott, C.B.E., D.S.O., A.F.C.; A. Cdre. G. I. L. Saye, C.B., O.B.E., A.F.C.; C/G. G. J. C. Paul, D.F.C.; G/C. G. A. Walker, C.B.E., D.S.O., D.F.C., A.D.C. and G/C. R. Faville, C.B.E. *Technical Branch*: G/C. T. N. Coslett, O.B.E. *Equipment Branch*: G/C. V. H. B. Roth, C.B.E.

The course lasts for 12 months and before it starts in January the selected officers will be attached to Air Ministry to be brought up-to-date with current R.A.F. problems.

Antipodean Co-operation

DURING Operation Dragon, the first important exercise in which the Australian 78th Wing has been engaged since arriving in Malta, the two squadrons were augmented by two Italian pilots in No. 75 Squadron and four French pilots in No. 76 Squadron. All were flying D.H. Vampire 9s.

H.M.S. "Vengeance"

THE light fleet carrier, H.M.S. *Vengeance*, which is being lent to the Royal Australian Navy, has been taken over by an Australian steaming party and is temporarily under the command of Cdr. C. M. Hudson, R.A.N. In December Capt. H. M. Burrell, R.A.N., will take over.

The ship is Australia's second carrier and will remain on loan until another light fleet carrier, at present being built in Britain, is completed.

No. 612 Squadron's Annual Dinner

AT the annual dinner of No. 612 (County of Aberdeen) Squadron, R.Aux.A.F., held recently at the Caledonian Hotel in Aberdeen, the Honorary Air Commodore, Sir Iain Forbes-Leith, Bt., proposed the toast of the guests, to which

IN MID-STREAM: When H.M.S. "Ocean," on leaving Korean waters, passed H.M.S. "Glory" off Hong Kong on her way to take over, the Westland-Sikorsky S-51 helicopter was transferred to the "Glory," to return to the battle area for further operational duties.

SERVICE AVIATION . . .

A.V-M. R. L. R. Atcherley, A.O.C. No. 12 Group, replied. Among those present were A. Cdre. C. G. Lott, Caledonian Sector Commander and G/C. W. D. Blackwood, S.A.S.O. No. 12 Group.

No. 612, of which S/L. G. W. Cory is the commanding officer, has recently returned to Dyce after having been absent for nearly 18 months owing to runway construction.

New Naval Helicopter Squadron

THE first operational helicopter squadron in the Royal Navy has been formed for service in Malaya. It is No. 848, commanded by Lt. Cdr. S. H. Suthers, D.S.C., R.N. The squadron will be equipped with American S.55s, ten of which arrived in this country in the S.S. *American Producer* last Tuesday, the U.S. Government having advanced the date of delivery of ten of these machines. No. 848 Squadron is stationed at Gosport, and here it will shortly receive its new ten-seat single-engine Sikorsky helicopters.

Until recently Lt. Cdr. Suthers has commanded the Naval Helicopter Training Unit (705 Squadron). His senior pilot, Lt. G. C. J. Knight, has also been flying in 705 Squadron since 1949. Reference is made to the first Westland-built S.55 on page 638.

R.A.F. Appointments

AFTER having been Director of Armament Engineering since February, 1950, A. Cdre. F. G. S. Mitchell, O.B.E., has been appointed A.O.C. No. 43 Group, Maintenance Command. He will take up his new post on December 1st, in succession to A. Cdre. A. F. Hutton, C.B.E., D.F.C., who now becomes S.A.S.O. at Technical Training Command H.Q. A. Cdre. Hutton will assume the acting rank of air vice-marshal.

Air Marshals' Club

AT a luncheon meeting of the Air Marshals' Club on Friday last, the Chief of the Air Staff, Marshal of the Royal Air Force Sir John Slessor, presided. Twenty members were present, including Marshals of the Royal Air Force Lord Trenchard, Sir John Salmond and Sir Edward Ellington.

Balloon Squadrons' Fund

THE R.A.F. Benevolent Fund has received £398 from G/C. A. W. N. Addison on behalf of the Southampton and Portsmouth Balloon Squadron's charity funds. When the squadrons were disbanded after the war, the money was set aside for the benefit of any members needing assistance. It was recently decided that the money should be given to the R.A.F. Benevolent Fund.

Arctic Exercises

SHIPS of the Home Fleet which sailed last Monday from Rosyth for an Arctic cruise included the aircraft carrier *Eagle*.

The purpose of the cruise is to give ships' companies some experience of operations in severe weather conditions, and to test equipment and communications. Carrier-borne and maritime aircraft are taking part and to this purpose four Shackletons of No. 120 Squadron R.A.F. (S/L. A. H. Simmonds, D.F.C.) are operating from Keflavik in Iceland.

The area in which the exercises are taking place in the Greenland Sea is now in Arctic winter darkness and temperatures of 20 deg below zero are expected.

ROYAL PRESENTATION: During her recent visit to No. 2600 L.A.A. Squadron, R.Aux.A.F., the Queen Mother presented the Hawker Siddeley Trophy for the best all-round gun team to Sgt. G. Eaton. On the right is S/L. Collings.

Reunions

ANY member of the R.A.F. Component of the British Services Mission to Burma who is interested in attending a reunion of that body is invited to communicate with F/L. B. H. Reece, A.F.C., R.A.F. Linton-on-Ouse, Yorkshire.

NORTH LUFFENHAM REVIEW: On Friday last, Field Marshal Lord Alexander flew to North Luffenham to inspect the Canadian No. 1 Fighter Wing. On arrival in the area his Dakota was smartly intercepted by Sabres of No. 439 Fighter Squadron, R.C.A.F. (top left) which, with air brakes fully out, flew past slowly. During the Wing ceremonial parade (bottom) Lord Alexander was accompanied at the saluting base by, left to right, G/C. E. B. Hale, R.C.A.F., A. Cdre. M. Costello, R.C.A.F., A.V-M. R. L. R. Atcherley, R.A.F. and Major General J. D. B. Smith. At the close of the parade Lord Alexander decorated Cpl. D. G. Short, R.A.F. (top right) with the British Empire Medal for saving a burning Sabre of No. 410 Squadron.
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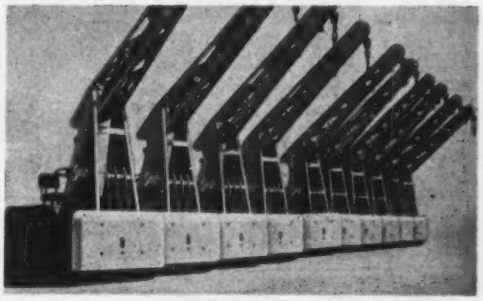

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32-SEATER Dakota with restrictions.

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THE proprietors of British Patent No. 628324 for "Retractable Landing Gear for Aircraft," desire to enter into negotiations with firms or firms for the sale of the patent or for the grant of licences thereunder.—Further particulars may be obtained from Marks and Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2. [8919]

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PHOTOGRAPHS of your own private aircraft, 3½ by 4½, 10d.; ½-p., 9d., P.C., 1/-; ½-p., 2/-; 1/1, 3/6. Mounting and colour extra. Xmas cards 12/- doz. Orders accepted up to November 29th.—C. Holland, 71, Coldharbour Road, Waddon, Croydon. [8891]

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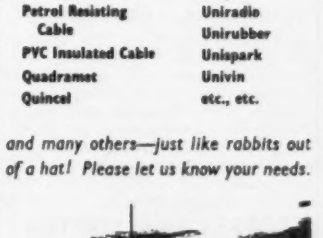

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

APPLICATION No. 111 from Scottish Aviation, Ltd., of Prestwick Airport, Prestwick, Ayrshire, for a U.K. internal seasonal service, initially with Dakota aircraft, for the carriage of passengers, supplementary freight and mail between London (Northolt) and Jersey (C.I.) at an initial frequency of from one to two services on weekdays during the period from June 1, 1953, to September 30, 1953.

APPLICATON No. 112 from Silver City Airways, Ltd., of 1 Great Cumberland Place, London, W.1, for an all-freight service, initially with Bristol 170 aircraft, for the carriage of freight and supplementary passengers between Southampton (Eastleigh) and Jersey (C.I.) with an intermediate traffic stop at Guernsey, at an initial frequency of from one to three services daily during the period from December 15, 1952, to December 31, 1961.

APPLICATION No. 113 from Scottish Aviation, Ltd., of Prestwick Airport, Prestwick, Ayrshire, for a U.K. internal service, initially with DH.89 and Dakota aircraft, for the carriage of passengers and supplementary freight between Glasgow (Renfrew) and/or Prestwick and Isle of Man (Ronaldsway) at a frequency of from three to twelve services daily during the period from May 1, 1953, to April 30, 1963.

THE applications will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [8921]

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STAFF item checking and job-costing time recorders (all makes) for quick cash sale; exceptional condition. —Box 7241 [0040]

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WE do not have to live on an old reputation as we are building a new one day by day. Our students' successes and our methods have proved themselves the foremost in the country.

OBTAIN free details and prospectus from "AVIGATION LTD.," 30, Central Chambers, EALING, W.5. (opposite Ealing Broadway Underground Stations). Tel.: Ealing 3049. [0240]

AIR SERVICE TRAINING, LTD., OF HAMBLE, INTRODUCE A GAS TURBINE COURSE (AE/3A).

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is accepted from the provisions of The Notification of Vacancies Order, 1952.

VICKERS-ARMSTRONGS, Ltd. (Aircraft Section) have vacancies at their Hurn Depot for the following staff:
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TRACING CHECKER
(male or female).

APPLY, in writing, to the Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey.

APPLICATIONS, with certain exceptions, are subject to the approval of the Ministry of Labour and National Service. [8926

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AIR TRAFFIC CONTROL OFFICER, GRADE II, EAST AFRICA.

A VACANCY exists for an air traffic control officer, Grade II, in East Africa (CSD 74/73/01). Candidates, between 25 and 35 years of age, should have aircrew and air traffic control experience and have passed a recognised air traffic control course. Duties will include air traffic control watchkeeping and aircrew briefing. The posts are on contract for four years, with salary in the scale £615-£900 per annum according to war service and approved experience, plus a gratuity of 13½ per cent. of total emoluments received during period of contract payable on expiry of contract. A temporary allowance of 25 per cent. of salary is also paid. Outfit allowance is £30.

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INTENDING candidates should apply in writing to the Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, S.W.1, giving brief details of their age, qualifications and experience. They should mention this paper and quote the reference No. CSD.74/73/01. [8908

CIVIL SERVICE COMMISSION

(1) Naval cadetships (special entry).
(2) First appointments in the Royal Marines.
(3) Entry to the Royal Military Academy, Sandhurst.
(4) Royal Air Force cadetships.

A COMBINED competition will be held, commencing on 4th February 17th, 1953. A centre in Germany (British Zone) will be included in the list of centres for the written examination.

AGE limits:

Naval cadetships (special entry), 17 years 2 months—17 years 10 months on March 1st, 1953.
First appointments in the Royal Marines, 17 years 7 months—18 years 1 month on March 1st, 1953.
Entry to Royal Military Academy, Sandhurst, 17½—18½ on March 1st, 1953.
Royal Air Force cadetships, 17½—19 on March 1st, 1953.

APPLICATION forms and conspectus of the competition may be obtained from the Secretary, Civil Service Commission, Burlington Gardens, London, W.1, quoting No. 109/51. Completed application forms must be received by him by December 4th, 1952. [8800

A SENIOR instructor is required by AIR SERVICE TRAINING, Ltd., to supervise instruction of aircraft apprentices abroad in the following subjects:—

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ADMINISTRATION

REMUNERATION approximately £1 600 per annum and free passage.—Write for application forms and details to the Commandant, Air Service Training, Ltd., Hamble, Southampton, marking letters and envelopes A.3. [8915

INSTRUCTOR demonstrators are required by AIR SERVICE TRAINING, Ltd., for Air Force Apprentice training abroad for the following trades:—

AIRFRAME
ENGINE
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ELECTRICAL
ARMAMENT

CANDIDATES must also be prepared to instruct in the basic phase of training; only those with up-to-date experience need apply. Remuneration approximately £1,600 per annum and free passage.—Write for application form and details to the Commandant, Air Service Training, Ltd., Hamble, Southampton, marking letters and envelopes A.3. [8916

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SENIOR AND INTERMEDIATE required by

SHORT BROS. AND HARLAND, LTD.,

in their Aircraft Drawing Office, BELFAST

(preferably with Aircraft Experience).

Applications, stating age, experience and salary required to:—

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SHORT BROS. AND HARLAND, LTD.,
QUEENS ISLAND, BELFAST. [8975

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WEST AFRICAN AIRWAYS CORPORATION have vacancies for pilots to be appointed as junior captains and invite applications from pilots who hold a current Airline Transport Pilot's licence. West African Airways Corporation have an expanding fleet of Marathon, Dove and Wayfarer aircraft.

SALARY according to qualifications and experience within the range of £1,000 per annum and £1,980 per annum.

FREE fully furnished accommodation is provided in West Africa, but married men on initial engagement may be required to serve for a few months before being joined by their families.

FREE return passages are provided each tour for the employee, his wife and up to two children, not exceeding 18 years of age.

TOURS of duty will be from 12 to 15 months with leave on full salary at the rate of one-fifth of the period of service in West Africa.

CONDITIONS of service will include membership of a contributory pension scheme allowing retirement at 45, subject to a minimum of 10 years' service. (Retirement five years earlier may be arranged by mutual agreement.) In the case of employees not completing 10 years' service, a gratuity arrangement exists whereby, subject to a minimum of four years' service, a payment at the rate of £150 for each full year of service will be made on termination of appointment.

COMPREHENSIVE contributory medical scheme exists for employees and their families.

APPLICATIONS should be submitted to the local Agents of W.A.A.C. B.O.A.C., Airways House (Room 105), Great West Road, Brentford, Middlesex. [7740

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SENIOR design and intermediate draughtsmen, preferably with aircraft experience for Cricklewood and Radlett offices. Consideration will be given to applicants with experience in light structural or mechanical engineering. Possession of O.N.C. or H.N.C. (Mech. or Elect.), an advantage.

WEIGHT control engineers with O.N.C. (Mech.). Previous experience preferred.

TECHNICAL assistants of degree or H.N.C. (Elect.) standard for the design and development of aircraft electrical systems. Previous experience preferred.

WRITE, stating age, qualifications and details of experience, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [9694

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BRITISH OVERSEAS AIRWAYS CORPORATION invite applications for the post of assistant engineering manager, repair factories, based at Treforest, South Wales.

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A. AND C. licensed engineer required for Boyingdon Airport unit. Viking endorsement essential. Good salary and conditions.—Applications to Personnel Officer, Field's of Croydon Airport, Surrey. [8907

LICENSED radio engineer and radio mechanics at our base at Stansted Airport, Essex. Apply by letter or telephone to the Senior Radio Engineer, Aviation Traders, Ltd., Southend Airport, Essex. Tel.: Rochford 56491. [9050

TECHNICAL illustrator required, aged 23 or over, with considerable practical experience.—Applications, in writing to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds., stating age, experience and salary required. [9060

CHIEF technician, aircraft accessories. Knowledge of heat transfer and aerodynamics essential. Please apply in writing, stating age, experience, and qualifications to Delaney Gallay, Ltd., Edgware Road, Cricklewood, London, N.W.2. [8958

AIRCRAFT or mechanical draughtsmen required, all grades. Apply, stating age, experience and salary required to The Chief Draughtsman, Alan Muntz and Co., Ltd., Aircraft Division, Langley Aerodrome, Slough, Bucks. [9050

BROCKWORTH ENGINEERING Co., Ltd., Hucclecote, Gloucester (branch of Hawker Siddeley Group, Ltd.), require for super-priority work on aero engines chief ratefixer with extensive knowledge of this class of work covering machining and assembly.

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TECHNICAL assistant, British H.N.C., age 20-25, required for interesting work in heat transfer test laboratory.—Apply in writing, giving age, qualifications, etc., to Delaney Gallay, Ltd., Edgware Road, Cricklewood, London, N.W.2. [8897

JIG and tool draughtsmen, fully experienced, required by Percival Aircraft, Ltd., Luton Airport, Beds. Good working conditions and full welfare facilities, including staff pension scheme.—Applications to the Personnel Manager, stating age, experience, salary required. [9000

SENIOR spares schedule clerk, capable of taking charge of compilation section, required by Percival Aircraft, Ltd., Luton Airport, Beds. Good welfare facilities, including staff pension scheme.—Applications, in writing, to Personnel Manager, stating age, experience and salary required. [9097

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Experience, Age and Salary

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LANCASHIRE AIRCRAFT CORPORATION, LTD. (Skywars of London), are now appointing additional navigating officers for their York fleet.—Applications from holders of appropriate M.C.A. licences should be made in writing to the Personnel Manager, Bovingdon Airport, Herts. [0590]

ARMSTRONG SIDDELEY MOTORS require technical assistants for research and development on gas turbine combustion systems. Opportunities exist for original work of a highly interesting nature in a new field.—Apply in detail to Reference SA.3, Personnel Manager, Armstrong Siddeley Motors, Coventry. [0595]

MECHANICAL engineering draughtsmen. Experienced men, preferably—although not necessarily—with aircraft experience, required for work associated with modern aircraft design.—Write, stating age, experience, salary, etc., and quoting reference MD/3, to Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.O.W. [0598]

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0428]

ARMSTRONG SIDDELEY MOTORS, Coventry, have a vacancy for a senior designer (mechanical), aged 30-35, workshop and aero engine design experience essential; gas turbine knowledge an advantage. For important work on the project design of gas turbine aero engines.—Apply in detail to Reference HSR.1, Personnel Manager, Armstrong Siddeley Motors, Coventry. [0594]

D. NAPIER & Son, Ltd., The Airport, Luton, Beds, require a stressman for work on aircraft and allied structural problems, preferably with three to five years experience in similar work, with technical standard of at least Higher National Certificate.—Apply, with full details, to the Personnel Manager at the above address. [0593]

DEVELOPMENT engineers required by company in the West Midlands connected with guided weapons project. Initiative and capacity for original thought are most important, but experience of development of metal fabrication techniques, experimental stress analysis, or plastic materials would be an advantage.—Replies to G.S.M., Box 3705. [0602]

IMPORTANT Midlands gas turbine aircraft engine manufacturer has vacancies for a number of designer and senior and junior draughtsmen. Although gas turbine experience is most advantageous it is not necessarily essential as training will be given in this specialised work to suitably qualified draughtsmen.—Apply, in some detail please, to Ref. F101, Box 3237. [0616]

OPPORTUNITIES are offered to experienced draughtsmen and designers in the aero gas-turbine field to deal with blade design, engine design, fuel and control systems and weight control. The positions arise in a progressive company in the London area and they are permanent and pensionable.—Write, with full particulars and reference ACJ, to Box 3715. [0606]

AN attractive and responsible position is open for a senior designer, with considerable experience in the field of aero gas turbines, for advanced project design work. Highest qualifications and extensive practical experience are essential. A four-figure salary is offered to the right man.—Write in confidence, with full information, to Box 3716. [0609]

WEIGHTS engineer required to take charge o weights department, also senior assistant, for work on fixed wing and helicopter aircraft. Good welfare facilities, including staff pension scheme.—Applications, in writing, to Technical Director, Percival Aircraft, Ltd., Luton Airport, Beds., giving details of age, training, qualifications, experience and salary required. [0592]

TEST laboratory assistants (male) required by Percival Aircraft, Ltd., Luton Airport, Beds. National Certificate standard and previous experience on design of test laboratory equipment desirable. Good welfare facilities, including staff pension scheme.—Applications, stating qualifications, experience, age and salary required, to Personnel Manager. [0599]

HANDLEY PAGE (Reading), Ltd., The Aerodrome, Hyde Woodley, Reading, have vacancies in their design offices for intermediate and senior draughtsmen, stressmen and loftsmen. They have an interesting project on hand. The positions are progressive and offer good scope for advancement to the right men.—Please send full particulars to the Personnel Officer. [0574]

REQUIRED immediately by Percival Aircraft, Ltd., Luton Airport, Beds., several draughtsmen with comprehensive experience of engine installations and allied systems. Good welfare facilities, including staff pension scheme.—Applications, in writing, stating age and qualifications, experience and salary required, to the Personnel Manager. [0601]

APPLICATIONS are invited from senior and intermediate design draughtsmen. Experience of aero-engine design desirable, but not essential. Also checkers. —Please write, stating age and giving details of previous experience in chronological order to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0630]

ENGLISH ELECTRIC have vacancies for aircraft draughtsmen at Warton Aerodrome, near Blackpool. Men with wood aircraft drawing office experience are invited to apply for these interesting positions which carry good salaries.—Write, giving full details, quoting reference 1208, to Central Personnel Services, The English Electric Co., Ltd., 336/7 Strand, London, W.C.2. [0640]

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd., Luton Airport, Beds. Applications are invited from senior and junior draughtsmen and stressmen, for work on this interesting programme. Good welfare facilities, including staff pension scheme. Write, giving details of experience and salary required, to Personnel Manager. [0595]

THE DE HAVILLAND AIRCRAFT CO. invites applications for a post in the Structural Test House. Applicants must have had experience of testing airframe components and reporting on same, and under supervision be capable of designing and stressing test rigs.—Apply stating age, experience and salary required, to Chief Structural Engineer (Aircraft), The de Havilland Aircraft Co., Ltd., Hatfield Aerodrome, Herts. [0603]

D. NAPIER & Son, Ltd., The Aircraft, Luton, Beds., have a vacancy for a junior weights engineer for weights analysis on aircraft structures. Minimum qualifications: Ordinary National Certificate and preferably some stress experience. Apprentices, who should have completed their National Service, should apply to the Personnel Manager at the above address, quoting full particulars of experience and education. [0629]

A VARIETY of posts for junior and senior technical assistants have to be filled in an expanding company in the London area which is engaged on aero gas-turbine research and development. Stressmen, development and performance engineers and compressor, turbine and engine testers are invited to apply. H.N.C. or degree preferred.—Write, with full details, quoting reference HIC, to Box 3718. [0611]

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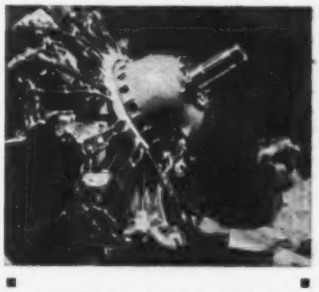

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SENIOR inspector wanted for company running small machine shop engaged on prototype work. Excellent surroundings and working conditions, permanent job to right man. Must have good personality and be thoroughly able, fully approved A.I.D.—Willis & Partners, Lymington. [8931]

INTEGRAL, Ltd., Birmingham Road, Wolverhampton, invite applications for vacancies on the staff in the design and development department for interesting work on aircraft hydraulic mechanisms. Experience of aircraft component design or testing and good technical qualifications are an advantage.—Will applicants please state age, qualifications, details of experience and salary required. [8934]

SENIOR scientific officers, scientific officers, patent examiner and patent officer classes. The Civil Service Commissioners invite applications for permanent and pensionable appointments to be filled by competitive interview during 1953. The scientific posts are in various government departments and cover a wide range of scientific research and development in most of the major fields of fundamental and applied science. The patent posts are in the Patent Office (Board of Trade), Admiralty and Ministry of Supply.

CANDIDATES must have obtained a university degree or with first or second-class honours in an appropriate scientific subject (including engineering) or in mathematics, or an equivalent qualification; or for scientific posts possess high professional attainments. Candidates for senior scientific officer posts must, in addition, have had at least three years' post-graduate or other approved experience.

AGE limits: Senior scientific officers, between 26 and 31; for scientific officers and patent classes, between 21 and 28 during 1952 (up to 31 for permanent members of the experimental officer class competing as scientific officers). London salary scales: Senior scientific officers (men), £912-£1,022 (women), £881-£917; scientific officers (men), £440-£707 (women), £440-£576; patent examiner and patent officer classes (men), £440-£655; (rates for women under review). Somewhat lower rates in the provinces.

FURTHER particulars from the Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1, quoting No. S.52/52 for senior scientific officers and S.52/52/S.126/52 for the other posts. [8901]

AERONAUTICAL service engineer required for installation, flight testing and servicing of instruments. Practical and theoretical knowledge of A.C. and D.C. amplifier systems and electronic engineering practice essential. Experience of electro-mechanical, servo and synchronous transmission systems together with H.N.C. or equivalent preferable. Must be prepared to travel. Pension scheme.—Apply, with full details, to Personnel Manager, Sperry Gyroscope Co., Ltd., Great West Road, Brentford, Middx. [8927]

SENIOR assistant is required for flight trials and assessment of airborne radar equipment. Experience of radar and similar work in the laboratory and in the air under operational conditions is essential. Candidates must be prepared to travel and work away from the laboratories. (Ref. S8/LE.1).—Replies should be sent to the Staff Manager, The Grove, Stanmore Common, Stanmore, Middlesex, stating age, qualifications and experience. [8922]

PHYSICISTS and engineers with degrees and Higher National Certificates are required for a field trials team and for assessment work in connection with the trials. Candidates must be prepared to travel and work away from the laboratories. Applications should be sent in writing to the Staff Manager (Ref. S8/JP.1) stating age, qualifications and experience to The Grove, Stanmore Common, Stanmore, Middlesex. [8923]

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APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero-engines.—Applications should state full particulars of experience and qualifications and should be addressed to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [8932]

INSTRUMENT mechanics required for the overhaul of aircraft instruments. Applicants should have first class experience on aircraft instruments generally, alternatively, specialised experience on sensitive altimeters and rate of climb indicators. Good wages, canteen.—Write in first instance to the Managing Director, Wynstruments, Ltd., Staverton Aerodrome, Gloucester. [8936]

THE de Havilland Aircraft Co., Ltd., will shortly be opening a drawing office at their Chester factory and there will be vacancies for senior and intermediate draughtsmen who are experienced in the design of aircraft structures, electrical and engine installations, also customers' special requirements for civil aircraft.—Apply in writing, giving résumé of experience, age, etc., to the Chief Draughtsman, de Havilland Aircraft Co., Ltd., Hatfield, Herts. [8800]

ROLLS-ROYCE, Ltd., Glasgow, invite applications from young qualified engineers for a vacancy as a technical assistant in their technical services department. This vacancy requires a knowledge of piston or gas turbine aero engines, and the successful applicant must have as a minimum requirement H.N.C. plus two years' practical experience.—Reply, giving full particulars of age, experience, technical qualifications and salary required, to the Personnel Manager, Rolls-Royce, Ltd., Hillington, Glasgow, marking applications TE/1. [8944]

DRAUGHTSMEN required by British Overseas Airways Corporation in their Central Design Office at London Airport, covering all aspects of aircraft design development as affecting British and American aircraft, including unit and component conversion. Experience in radio installation work, electronics, hydraulics, modification and repair desirable. Knowledge of A.R.B. design requirements. A.E.S.D. rates attracting good proficiency bonus where experience and qualifications allow. Pension scheme, sickness and holiday facilities.—Apply: Staff Supt. (Recruitment), London Airport, Hounslow, Middx., or Local Employment Exchange. [8913]

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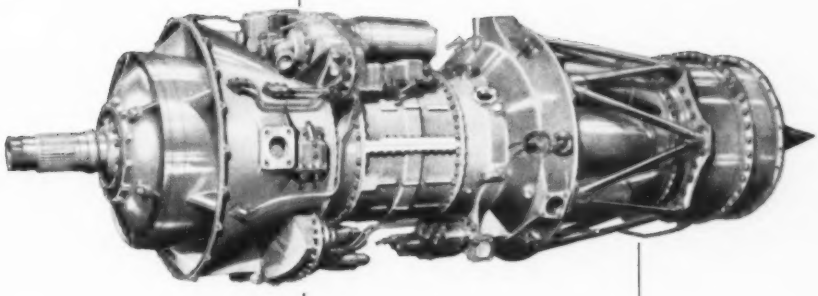

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